The
Electrical Review

VOL. CXX FEBRUARY 26, 1937. No. 3092

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements-Official Notices-Tenders—Supp. 17.

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British Engineers Abroad

MANY—perhaps we might say most—of our readers have been confronted at some time or other with the problem: What shall an engineering student do when he has finished his college course? During his years of study he has looked forward to the days when he would start out definitely to make a career for himself. That important stage having been reached, what is the best course for him to pursue?

The question itself is as old as the profession, but the situation is very different now from what it was, say, ten, twenty or thirty years ago, and the great changes that are taking place all over the world to-day do not lessen the anxiety which is felt either by students themselves or by parents and other advisers who seek to guide them.

When dealing with the subject on a former occasion when there was a prolonged slump in engineering industry, we and our contributors expressed the view that the following years would make such large demands upon engineering that the problem would almost settle itself. Happily, to-day British engineering is enjoying a period of prosperity, and engineers are being absorbed at home as never before. Let us hope the period of great activity will be prolonged by overseas developments.

We must note, however, that the development of technical education in the Dominions, in the Colonies, and in India, as has lately been pointed out by *The Central*, now enables these countries to dispense almost completely with the employment of men from outside their own areas for ordinary routine engineering work.

In past years a large proportion of the men from our leading colleges went abroad, but an almost complete closure has come upon these former avenues, and it is feared that the future will afford fewer and fewer opportunities for our own men outside our own country. The importance of the matter to British manufacturers who in the past have received much business from British engineers at overseas outposts, indicates an aspect that cannot be overlooked.

For our present purpose we may set aside the case of the young men who are able through special circumstances, such as relationship or on account of social connections to feel that their future is secure—students, for example, who have entered upon a college course for the express purpose of fitting themselves for a post which will be waiting for them as soon as they are ready. These are few in proportion to the total, and we confine our attention at the moment to the thousands of young men who wish to use their qualifications in overseas lands where engineering operations are essential to world development. What is the best possible course we can adopt to assist them in their dilemma?

The matter was discussed at a meeting of Old Centralians last autumn, and a good deal of useful information was brought together in the December number of *The Central*, concerning the economic, financial, educational, and other factors that are at work in various "markets." We have not space for the reproduction of these statements, so, feeling that readers of the ELECTRICAL REVIEW would regard the subject as one of common concern, we have invited Sir Alfred Chatterton, the president of the Old Centralians, to review the position in a special article.

When the discussion took place last autumn several papers were contributed relating to prospects in Argentina, in India, in Egypt and the Sudan, and in Malaya which are worthy of close study. It was then resolved to form "The Overseas Engineers' Association," and to approach other representative bodies of engineers, including technical institutions and colleges, inviting their co-operation.

We commend Sir Alfred Chatteron's article on page 319 to the attention of those who are able to offer suggestions, for we feel sure that the problem is one in which older professional and industrial men will be willing to help students whose early aspirations are mixed with a genuine anxiety.

A National Testing Station?

THE establishment at Teddington of a station for proving circuit-breakers and fuses rated up to 250,000 kVA is under consideration by the Department of Scientific and Industrial Research. While the capacity proposed is very much less than that of any of the three private stations now in being, it would be great enough to meet most requirements of the many manufacturing firms which are unable to bear the high cost of individual testing equipments. The growing tendency on the part of users to require certificates covering type tests of switchgear could thus be met without undue expense. Moreover, the authority behind such certificates might assist export trade. Any action of the Department will, no doubt, be determined by the response of the industry to its proposal, one indication of a demand being the ability to secure guarantees from the industry to meet a charge of about £7,500 per annum for ten years. This is not a very big sum to find, especially as the guarantors would probably be given priority for their apparatus.

Feeling the Effects

DURING last year the Commercial Gas Company's sales decreased by 1.1 per cent. The acting chairman at the annual meeting last week attributed this solely to the falling off in domestic consumption; he said that sales for industrial purposes had increased by 10.7 per cent. He seemed to be rather undecided regarding the reason for this, however. Although he confessed that the company was feeling the effects of electrical competition, he mentioned as the reason for the decline rehousing schemes, which, he said, meant fewer people in the same area. The electricity suppliers in London do not seem to have noticed this yet. To combat electrical activities the company had let loose an army of trained canvassers upon the people in the area, and good results were reported. A "home service section" had also been established to advise consumers on the use of gas cookers, "particularly where a black cooker was replaced by an enamelled cooker." Many consumers seem to have taken other advice, and changed their black (gas) cookers for enamelled (electric) ones.

Competition Feared

WHEN the Brigg Urban District Council recently discussed the electricity charges in its area, the chairman pointed out that if they pressed hard to get them reduced this might be detrimental to the Council as owners of the gas undertaking. It was also recalled that a few weeks previously the Council had refused to allow the North Lincolnshire and Howdenshire Electricity Co. to provide installations in houses belonging to the local authority. However, it was decided that the company should be approached with a view to a reduction. We are sure that there must be a large number of Brigg ratepayers who are more eager to secure the benefits of cheaper electricity than to have the Council's gas undertaking make more profit out of them.

Salesmanship Courses

THE Electrical Power Engineers' Association is not altogether pleased with the E.D.A. Salesmanship Course; it objects particularly to the suggestion that participants should be assisted in paying for the course by the undertakings employing them. It points out that it already has salesmanship training courses for technical engineers and sales engineers and assistants which are quite as deserving of the undertakings' support. In fact, they are more worthy, as they do not merely aim at making "high-powered, super-charged sales hustlers," but at training men to "deal intelligently with the technical, economic and commercial problems which arise between undertakers and consumers." The Association considers that its collaboration in the scheme should have been sought by E.D.A., and suggests that, even now, it is not too late for the two bodies to get together, possibly with the aim of making the E.P.E.A. scheme an extension of the E.D.A. course. This suggestion shows that the E.P.E.A. realises that its own scheme is on a higher plane, and that is the whole crux of the matter. Sales *engineers* are essential to the supply industry, but it is not necessary for all salesmen (and saleswomen) to be engineers. While it may be considered inequitable that financial assistance should be given only to sales staffs, this again serves to stress the difference between the two classes. The E.P.E.A. has gained for its members a status, and remuneration in proportion to it, which many mere salesmen must regard with envy.

Relative Importance

WHILE we are on the subject of the E.D.A. Salesmanship Course we will correct an error which slipped into our last issue. We reported Mr. C. D. Taite as saying that this was the Association's most important development in the last twelve *years*. Months was the word we should have used. The mistake is obvious when it is remembered how many far-reaching campaigns E.D.A. has been responsible for in the last few years—the Electric Home, Hotel Lighting, Industrial Lighting, Better Light—Better Sight, A Million More Consumers, to mention some of the more prominent, apart from the important exhibition activities which have been an outstanding feature of E.D.A.'s work. Still, the Salesmanship Course *is* an important development.

A.C. Motors Afloat

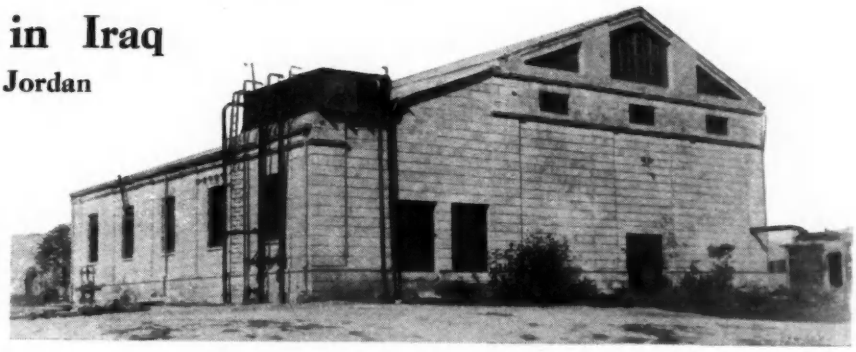
DESPITE the advances that have taken place in recent years in the design and construction of a.c. motors and their adoption for new schemes on land, they have made little headway at sea, except for propulsion. Auxiliary machinery on board ship, such as pumps in the engine room and cargo winches on deck, involves the use of a number of different drives that call for individual speed variation (though experience indicates that the extent of this requirement is often exaggerated), which weights opinion in favour of the d.c. machine. A Diesel-electric vessel has recently completed her trials in which all the auxiliaries are driven by squirrel-cage motors. This is the Hamburg-Amerika cargo vessel *Wuppertal* of 9,500 tons deadweight, which has been built for service between Australia and the Dutch East Indies. The propulsion motor delivers 6,800 s.h.p. on the Brown-Boveri system. Considerable savings in first cost and in maintenance are expected to result from the taking of all energy used for power and lighting from the main generators. This principle was advocated by Mr. A. Regnauld in an article which appeared in the ELECTRICAL REVIEW a little while ago, when discussing the advantages of electric propulsion for the new Cunard-White Star liner, but the suggestion met with some adverse criticism from one or two correspondents.

Electricity and Coal

How closely interwoven are the interests of the electrical industry with developments in other fields of engineering was well illustrated at the annual meeting of the Electrical Research Association. Prominence was given by Mr. E. B. Wedmore (the director) to the important investigations that are being carried out in regard to the use of steam at high pressures and temperatures, which involves a study of alloy steels and co-operation with the metallurgist. The result is seen in the happy paradox that the greater the reduction in the fractions of pounds of coal burned per kWh generated, the greater the total tonnage that is required by our generating stations to meet the additional public demand for B.th.u. that will be used as low-priced electricity but not as raw coal—a much better method.

Electricity in Iraq

By F. V. Jordan



The exterior of the Mosul power station

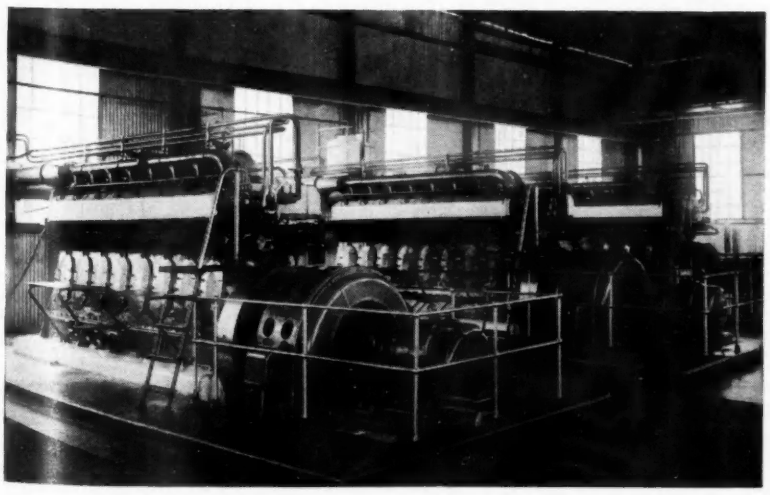
BEFORE the War there was no public supply of electricity in Mesopotamia, and only a few small plants existed at such places as embassies and the offices of foreign trading concerns. In 1915 a supply was made available for military needs at first by means of petrol-driven sets up to 25-kW capacity run by the regular Royal Engineers.

Early in 1916 it was realised that in order to maintain the health of the troops central power stations should be constructed, and Colonel J. S. Pitkeathly, electrical engineer of Delhi Province, took charge of this work with an Electrical and Mechanical Section of the R.E. formed of engineers taken from supply undertakings in India. Under the new regime electrical matters went ahead rapidly, much of the plant being obtained second-hand from various parts of India.

Basrah was the first town in Iraq to have a power station of its own, and two 120-kW Howden-Lancashire Dynamo d.c. sets taken from the railway power house at Lahore with B. & W. coal-fired boilers were installed. Coal at that time cost at least £6 per ton, and as soon as possible oil fuel was substituted, as the Anglo-Persian Oil Co.'s refinery at Abadan was less than twenty miles away. By 1919 it contained 1,800 kW of plant, made up of Howden, Browett-Lindley and Belliss engines. This equipment continued in operation until March, 1934, when the erection of a generating station at Margil was completed.

Between 1916 and 1919 power stations were erected at each town and camp as these were occupied by the Army. These usually contained horizontal engines and belt-driven dynamos up to 80-kW capacity. In many cases the units were of the portable type, which when converted to oil burning gave good service. Baghdad was favoured with a brand-new plant consisting of Browett-Lindley 500-kW sets and B. & W. oil-fired boilers. This plant was closed down in 1932 when the supply was taken over by the new steam-turbine station erected by the Baghdad Electric Light and Power Co.

When Mosul was captured in October, 1918 no fewer than eighteen power houses were in operation, and more plant was required. It fell to my lot to make up a power house with whatever was available, so six of the old 25-kW dynamos, which had outlasted their engines, were sent up and direct-coupled to German lorry engines made up from a dump outside Mosul. The "star turn" was a 4-ton ice plant driven by a 160 h.p. Mercedes aeroplane engine, which ran faultlessly for two summers.



A view of the Basrah generating equipment

None of these war-time stations exists to-day, as until a few years ago plant in this country was run until something broke, maintenance being non-existent except where a European was in charge.

Except in the cities of Baghdad, Mosul and Basrah, there is not a large demand for electricity as Arabs rise with the sun and retire at sunset. At present thirty-four towns have electricity schemes, twenty of which are owned by the municipalities and fourteen by concessionaires. The lot of the latter is not a happy one; his licence is renewed for not more than three years at a time, and if the local municipality decides to start an electricity supply scheme no compensation is given. He therefore cuts his costs to an absolute minimum, and as there are no electricity supply regulations in this country the result is a "Heath-Robinson" scheme both inside and outside the power house, but somehow it works and the concessionaire makes money, but the plant is not in a fit state to be taken over by the municipality. In some cases the concessionaire is a flour-mill owner and uses the same engine for both purposes.

As an example of a concessionaire scheme, Mosul, a city of 100,000 inhabitants in Northern Iraq, may be cited. Here the municipality, after much procrastination, decided to proceed with a new scheme with Belliss and Met.-Vick. Diesel a.c. plant and a distribution system by Callenders. The concessionaire, who for some years had been threatened with this, was unable to provide properly for the maintenance of his plant and mains and was losing much of his energy in mains drop at peak load. He continued to run in competition for four months until he lost nearly all his consumers. This concessionaire had been giving a supply for twelve years to only 720 consumers; after less than three years running the municipality has 3,500 and the number is rapidly increasing, and the scheme is a financial success.

All municipal undertakings in Iraq are administered by a board of which the *Mutarsarrif*, or lieutenant-governor of the province, is president. This eliminates much of the "wire-pulling" that took place when they came directly under the municipal council. The *Mutarsarrif* in turn is responsible to the Ministry of the Interior.

At the end of 1935 it was decided to form a Department of Municipalities, with its own staff of engineers in Baghdad to deal with all matters in connection with electricity and water supplies in an endeavour to centralise control and to frame badly needed regulations as to the supply of electricity. Prior to the formation of this Department each concern was run by its own engineer, who in the small undertakings was usually a local man with very little experience of electricity supply. No figures of costs were kept, and most undertakings were run at a loss, as no provision was made for depreciation or purchase of new plant. The sum of £200,000 has been allotted to new municipal electricity and water schemes, and orders have already been placed for six complete new power stations to supersede those at present run by concessionaires.

Except in Baghdad, Mosul and Basrah the only power load possible is due to corn mills and small workshops. In the former case the drive is usually by horizontal heavy-oil engines, and to compete with these power must be supplied at under 1d. per kWh. I met with no success with a restricted-hour tariff whereby the first 200 kWh per month was charged at 2d. and all over at 1d. None of the small power houses give a continuous supply, except in the summer for fans, which Iraquis are beginning to appreciate. There is a good future demand for 16-in. oscillating table fans, but they must be light, silent, and have a good handle, as the average householder has one fan which he moves about as required; they should also be fitted by the makers with at least 12 ft. of good workshop-type flexible wire

and a plug. The flexible cord available in this country, with the exception of C.M.A. material, is of the worst kind, and one can get a shock from new wire. By holding one end of the copper the insulation can be stripped clean off by passing two fingers down the wire, but in the absence of any regulation it is impossible to stop its use.

The standard of wiring is rising rapidly. Up to 1932 cleat wiring was almost universal; now it has been replaced by Bergmann tubing, although capping and casing is still used. In Baghdad concealed wiring is being energetically pushed by the G.E.C. agents, but it is expensive as compared with the older systems. Nevertheless, most of the new houses are wired on this system as the tenants are now demanding it.

The average price charged for lighting throughout the country is 25 fils (6d.). Where a continuous supply is given the power rate is about 10 fils. In Mosul a special domestic scale was introduced, in which the first 30 kWh per month was charged at 25 fils, 31 to 40 at 20 fils, 41 to 50 at 15 fils, and all over 50 at 10 fils, but it did not have the desired effect, and only about 4 per cent. of the consumers used more than 50 kWh per month. Slot-meter and other special rates of charging in use in England would not operate here, the former owing to theft and the latter because the consumers cannot understand them.

In Baghdad there has been a good demand for electric refrigerators during the last summer, but the Electric Light and Power Co. has not so far introduced any special rates for them, so that one must use 50 kWh per month at the full rate of 25 fils to get on to the reduced scale of 12 fils. Electric cookers and water heaters are non-existent in Iraq, and will be until electricity is available at 5 fils per kWh. Separate circuits for cheaper power rates cannot be used in this country, as entry to a Mahometan house, where the women-folk are in *purdah*, can be obtained only in the presence of an inspector of police, the *muktar* or head man of the district, and the head priest of the nearest mosque. By the time these have been gathered together and one is admitted to the house, the householder has had time to remove all traces of the misuse of the power circuit. The same remarks apply to suspected theft of current, and the only way to prevent it is to encase the meter and main fuses in a strong sealed teak box.

The following is a short description of three principal undertakings in Iraq. In Baghdad the new station of the Light and Power Co. contains two 2,500-kW Brown-Boveri turbo-alternators generating at 11 kV and three oil-fired Babcock & Wilcox boilers. A 5,000-kW Parsons turbo-alternator is expected to be running before next winter. The maximum load is at present 2,400 kW. Distribution is mainly overhead, and the old war-time station is now a rotary sub-station supplying d.c. to the centre of the city. Extensions and outlying districts have an a.c. supply. High- and low-voltage lines are run on the same poles with transformers mounted where required. The 6,000 street lamps are electric. The Baghdad E.L. & P. Co. has a fifty years' concession dating from 1928. Consumers now number 12,500.

The new Port Trust station at Basrah is situated at Margil, north of the city, and contains five Ruston-Hornsby vertical Diesel engines coupled to Lancashire-Dynamo 400-V three-phase alternators of a total capacity of 1,615 kW, a new 550-kW set having just been added. The old power house is fed by an underground 3.3-kV cable and contains one 150-kW rectifier and one 75-kW Peebles-LaCour convertor installed during the War. The maximum load is 700 kW and the number of consumers 2,200. The whole of the distribution system of the undertaking is overhead.

The present Mosual station, which was started in June, 1933, contains two 200-kW and one 400-kW Belliss & Morcom-Met.-Vick. 3.3-kV alternators with Met.-Vick. switchgear. The distribution system was carried out by Callender's, and there are two high-voltage sub-stations and two low-voltage underground feeders. The whole of the distribution is overhead and is of the vertical wire type using shackle insulators only.

There are now 3,500 consumers and the maximum lighting load is 345 kW. This does not include the three 20-h.p. water-supply pumps, which during the last eighteen months have been converted from oil to electric drive, and two new 9-in. high-lift pumps (W. H. Allen, Sons & Co.) driven by 90 h.p., 3.3-kV Met.-Vick motors. These pumps are closed down from one hour before sunset until after midnight.

Top: Laying cables in Mosul. Centre: An 11,000-V pole-mounted switch in Baghdad. Below: Difficult overhead line work in Mosul

On account of the large storage capacity the pumps can be shut down at any time from the adjacent power station, the load factor of which is over 60 per cent.

Excavating Machinery at Quarries

The Mines Department has reissued the Memorandum on the Electrical Equipment of Excavating Machinery at Quarries which appeared as Appendix II to the Reports of H.M. Inspectors of Mines and Quarries, 1935.

The Memorandum was prepared by the Electrical Inspector for Mines for the information and guidance of manufacturers and users of such apparatus and can be obtained from the Stationery Office for 1d. In the covering circular (M.D. Circ. No. 87) it is stated that the use of plain tough-rubber sheathed cables for carrying electricity to large diggers or conveyors involves, even at medium voltages, a risk of shock, and that cables used for these purposes should have a protective earthed-metal screen.

A Large Hospital Installation

Many applications of electricity

THE six-storey block of buildings in Huntley Street, W.C.1, which was recently opened by the Duke of Kent, as an extension of the University College Hospital, is intended to accommodate patients who require a high standard of hospital treatment and are able to pay reasonable charges for private rooms.

A new service has been run in from the 400-230-V a.c. mains of St. Pancras Borough Council. The consumers' side of the dividing box is connected to a bus-bar chamber, the phase and neutral leads being coloured in accordance with the appropriate British Standard Specification, a procedure that has been adopted throughout the installation. From this adaptable bus-bar chamber the supply is taken to a 1,000-A G.E.C. oil circuit-breaker controlling the distribution panels which serve the entire installation.

The four main services for power, lighting, heating and X-ray apparatus are sectioned by four air-break switch units with overload protection which includes provision for ammeters with current transformers. One of these switches supplies a four-way switch-fuse panel serving the three existing X-ray rooms and a fourth room to be similarly equipped later. The other air-break switches control nine iron-clad three-phase switch-fuses for power and eighteen and seventeen single-phase units for lighting and heating. The connecting cables are run in trunking under the floor, the outlets being v.i.r. in screwed-steel conduit. The switch- and fuse-gear is of G.E.C. manufacture. Circuit switches are by Walsall Conduits, Ltd., in the corridors and elsewhere in the building, where local sub-circuit fuse-boards have been supplied by Wm. White.

A typical private ward with bedside control panel

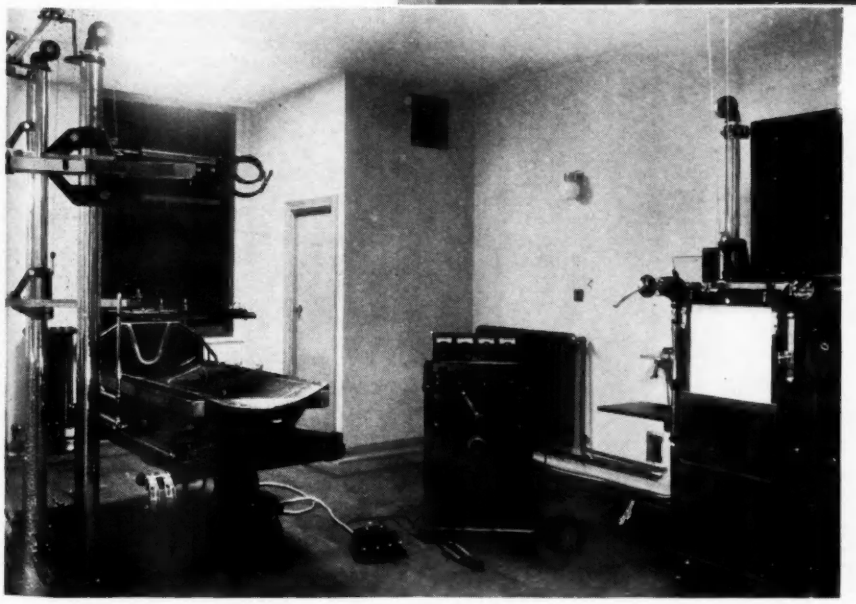
In the switch room is the master-clock controlling the Gent 24-V accumulator system of impulse-clocks, twenty-eight of which are in use, in addition to six synchronous mains-driven clocks of the same make with second hands in the operating theatres. Here, also, is the transformer for providing 24 V for the extensive signalling installation.

Under the ceiling above the door of the switch-room a junction box receives all cables, which are connected through a false ceiling in the corridor to another junction box from which the rising mains start. This arrangement allows the circuits for the different services to follow the most suitable routes, obviating crossing over, and to be kept distinct throughout. As the building contains over ten miles of Walsall conduit, which is installed in special chases in the brickwork, for taking forty miles of Johnson & Philips v.i.r. cable, this is an important feature of the installation.

A notable fitting in each of the three operating theatres on the sixth floor is a large Zeiss shadowless reflector with double-filament lamp. The 150-W filament in normal use is supplied at 230 V; the other, rated at 100 W, comes into circuit automatically should the outside supply fail, when it is fed at 12 V from a Pritchett & Gold 120-Ah battery arranged for trickle- or quick-charging through a Westinghouse rectifier. A red light warns the electrical staff of the change-over. The 12-V supply is also used for the portable surgeon's lamp in the nose, ear and throat theatre, in which a Zenith low-voltage control panel embodies resistances for varying the intensity of illumination in accordance with the requirements of the circumstances prevailing in any case.

All switches in operating theatres are of the mercury flash-proof type to avoid risk of anæsthetic explosion. General lighting is by Troughton & Young fittings. Air fed in from the warmed plenum system is extracted by some of the thirteen Keith-Blackman exhaust fans installed in various parts of the premises. Two luminous X-ray viewing boxes are let into the wall.

There are seventy-seven private wards and in each of these considerable addition to the comfort of patients is given by the provision of a multiple Wallsall Conduits panel at the side of the bed in which Crabtree fittings have been assembled in three divisions (two mains and one low-voltage) by the Phœnix Telephone & Electric Works. The switches incorporated control the ceiling light, the louvred examination fitting over the bed, and a bedside lamp, connected by white "Maconite" (which is used everywhere instead of flex); a third switch allows a patient to plug in an all-mains wireless set, the whole forming a compact and neat piece of equipment.



One of the three X-ray rooms

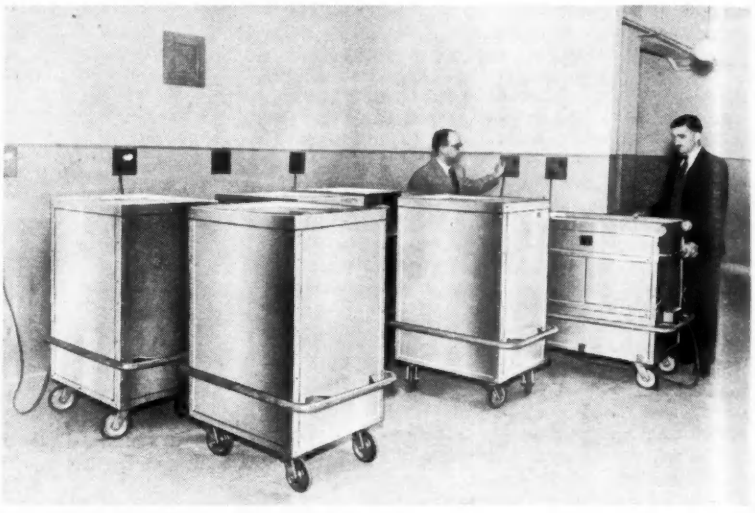
[*Elec. Rev.* photos.

There is also a plug for a G.P.O. telephone extension and one for the press-button cord of the Phœnix ward-signal system. When the button for the latter is operated, a red lamp lights over the door and a buzzer is sounded in the ward kitchen and duty room, and the number of the room calling appears on an illuminated screen in both places. The signal is continued until a red button-lamp on the bedside panel

has been depressed. Should the patient pull the plug out of its socket, a signal is given in the same way, so that prompt attention can always be paid to his needs.

Heating is by a hot-water radiator, but additional warmth can be obtained from a Berry "Magi-panel" fire (to the psychological value of which importance is attached) with two separately switched 500-W elements. For enabling X-ray diagnosis to be carried out when the patient cannot be moved from his room a 15-A switch plug is provided, and there are also three 25-A plugs in each corridor for the same purpose. The duty rooms are heated by portable electric fires for which 15-A switch plugs have been installed with two 2-A plugs for reading lamps.

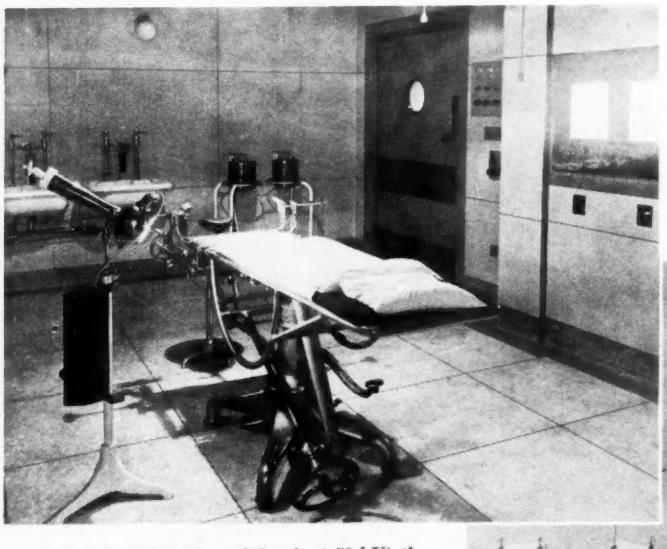
In each of the three X-ray rooms are installed a 25-A plug, a Keith-Blackman extractor fan, two G.E.C. laylights incorporating eight 75-W lamps in all and three Troughton & Young wall lights. The lead-covered Henley high-voltage cable connecting the X-ray tubes with the transformers in the basement immediately below are run in cavities in the wall and through a false ceiling from which they emerge by Paxolin bushings with external earth sheath as heavy rubber-covered leads. The tubes, which are intended for diagnostic work, are operated at voltages up to 120 kV.



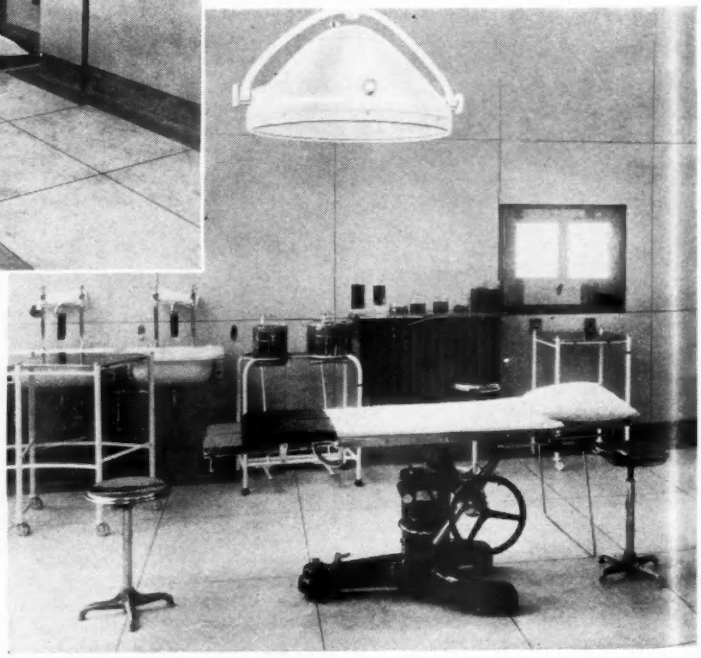
A group of electrically heated food trolleys

[*Elec. Rev. photo.*

One X-ray room contains the "Super D" set of Watson & Sons (Electro-Medical), Ltd., which was shown at the Radiological Exhibition and described in the ELECTRICAL REVIEW of December 11th. In the other two are units by A. E. Dean & Co. and by Newton & Wright, Ltd. All include equipment designed to secure the closest control of the rays with the patient in any position. In the same room as the Dean unit is a Philips dental set (50 mA at 50 kV) the transformer and tube being included in a highly flexible unit of small dimensions.



Full lighting of the film-loading room is automatically cut off as soon as an attempt is made to open a drawer containing undeveloped films, leaving a green laylight to provide a modicum of illumination. Green laylights also illuminate the developing room, in which the temperature of the solution is maintained by means of a Bray "Chromalox" 1-kW immersion element. The three consulting rooms are equipped with plugs for electric heating as well as lighting.



Above: The ear, nose and throat theatre. Right: A general operating theatre

[*Elec. Rev. photos.*

For general lighting throughout the building some 2,000 Siemens lamps are installed, mostly in Troughton & Young fittings. Inter-communication is by G.E.C. "Reliance" automatic telephones. An elaborate staff signal system has been provided by the Instanta Electrical Co. This is controlled from the porter's lodge at the main entrance and up to eighty-five call signals can be given at any convenient points by selecting the appropriate sequence of numbers from 1, 2, 3 and 4 in various combinations, so that any member of the staff can be communicated with quickly in case his presence is required for any purpose wherever he may be.

Two Express bed lifts and one passenger lift are installed, the motor driving the latter being fitted with eddy current brakes. Prominent among the kitchen service equipment are five 1,000-W and one 1,500-W food warmers on trolleys (one for each floor) by F. V. Magrini, Ltd. These are connected to the heating circuit for about twenty minutes and after being filled with food in the main kitchen are taken up to the various floors by lift. Five thermostatically controlled refrigerators by J. & E. Hall, a Carron "Peerless" potato peeler and a dough mixer are among the other items of electrical equipment in the culinary department.

Messrs. T. Clarke & Co. were responsible for the entire installation work, which was carried out to the instructions of Mr. W. R. D. Jessop, chief engineer of the Hospital, and with the co-operation of Mr. D. E. Cave, the electrical engineer. The installation provides a good example of pre-planning, in which the essential part to be played by electricity has been properly recognised in the design of the building.

British Engineers Abroad. By Sir Alfred Chatterton

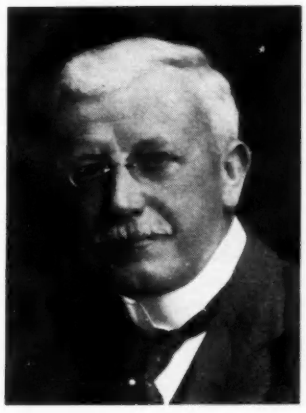
What are the prospects for the future?

IN the last number of *The Central*, which is the Journal of the Old Students of what is now known as the City and Guilds (Engineering) College, South Kensington, is a report of a debate which was recently held on "The Future Prospects of British Engineers Abroad." The Association has over 1,300 members, and apart from social gatherings it holds a meeting once a year to discuss some subject of interest to engineers which is outside the range of the purely technical institutions and which yet may be of great practical importance. The most senior members are near the end of their careers, whilst the most junior are just starting in life. The underlying idea is that the former, from their wide range of experience, which covers just half a century, should contribute something that may be of use to their juniors. Through the medium of *The Central* the value of these discussions is enhanced, as they can be made available to the younger members of the great body of engineering, scientific and technical men in this country.

It may be of interest to describe briefly the procedure adopted to ensure a good discussion. The subject having been selected by the Committee, half a dozen or more members of varying degrees of seniority are supplied with a statement of the reasons for bringing the subject up and are asked to supply notes thereon from the results of their own experience. These notes are printed and circulated some time before the meeting together with the original draft of the Committee. The members then come to the meeting fully understanding its object and are thus able to put forward their carefully considered views.

Under these conditions we discussed "The Future Prospects of British Engineers Abroad," and at the end of the meeting a resolution was passed to the effect that an attempt should be made to secure the co-operation of representative bodies of engineers, technical institutions and colleges in establishing a central organisation to disseminate information regarding employment abroad and to devise means to eliminate the difficulties which have arisen owing to the almost universal short-term nature of such engagements.

In the very intense international rivalry in the realms of trade and commerce which has arisen since the war attention has been mainly focused on our dwindling exports and overabundant imports of material goods whilst the gradual cessation of exports of engineers and scientific men has almost entirely been ignored. Yet these are the men who have very largely contributed to the spreading of British influence and culture and have done so much to build up and maintain markets for British manufacturers.



[*Elliott & Fry*

Sir Alfred Chatterton, C.I.E., B.Sc., &c., the President of the Old Centralians, has had a distinguished career in India in the engineering, industrial and educational spheres

The change that has come about was inevitable and is due to two main causes. First a desire for local self-sufficiency and for the wider range of opportunity which a great variety of industries offers to the rising generation. Secondly, to the creation of local institutions capable of imparting advanced instruction in science and technology. A diversified national life is what our Dominions and Colonies are all aiming at and straining their resources to secure. The same thing is going on in India and in most other parts of the world not directly associated with us. This is all as it should be and forms no subject for a grievance of any kind.

What our discussion brought into prominence, however, was the fact that there still remains a very considerable field open to us, but under conditions greatly differing from those that formerly prevailed. The openings left are mainly for men of great and special experience, and as they are specific jobs the engagements are usually for comparatively short periods and are therefore unattractive.

To-day we cannot send our young men overseas to find life-long careers, but there is still a demand for our best men for short periods, and if they are unable to go men of similar calibre belonging to other nations are apparently able and willing to do so. The trouble is not that men are unwilling to go overseas, but that they cannot afford to break connections which they have formed, knowing full well that on their return they will have to start afresh. The position is only serious if we neglect to recognise that it has arisen, and I think that the Old Centralians have done national service in drawing attention to it.

In the discussion illuminating facts were brought forward regarding the changed conditions of overseas appointments, and it would seem that if these are widely known and properly appreciated there will be comparatively little difficulty in providing a remedy. The resolution which was passed at the meeting suggested that steps should be taken to form an association to deal with the problem. As a preliminary to this it is desirable that the information already available should be widely disseminated through the medium of scientific and technical journals and opportunity given for free discussion. This course will help to some extent to bring about a better state of things, as it will bring home to many, who have hitherto not considered it from that point of view, that service abroad is not merely a matter of concern to individuals but is also essential to the well-being and prosperity of the country.

The progressive nations of the world are seeking to extend their influence in all those regions which are still in what may be termed a primitive condition, and it behoves us, therefore, to see that we do not lose the very favourable position which we have hitherto been able to enjoy. To this end it would seem to be desirable to start a central office in London to collect information from all parts of the world regarding openings for the services of highly-trained and experienced men, and to make the results known, either to private individuals or through the Press to the technical and scientific public. To run such an office would probably cost about £1,000 a year, and it should surely not be difficult to raise this sum considering the vital importance of maintaining our prestige and connections with lands overseas.

It is perhaps premature to suggest methods by which men going overseas can be ensured that they shall not lose by doing so. In certain fields of work, however, it seems fairly obvious that much can be done by making arrangements for men to be lent for foreign service and guaranteed re-employment on their return.

Universities and technical colleges might well allow their best men to add to their experience by a term of service abroad. The restrictions on foreign loans and the financial arrangements of London holding companies, whereby locally registered companies with local directorates exercise control, have undoubtedly helped to restrict the field of employment of our engineers, and it would be of advantage to have available more information on these and kindred matters. It would be one of the functions of the association to obtain it.

Modern Broadcasting Methods

MODERN developments in radio broadcasting transmission and television were described in a paper by Sir Noel Ashbridge, Controller (Engineering) of the B.B.C., read at the INSTITUTION OF CIVIL ENGINEERS on February 16th.

The author, dealing with studio design, mentioned the advantages of the ribbon microphone and described methods of recording. He then referred to the use of telephone cables and discussed attenuation. Various means of economising energy were described.

Turning to the short-wave Empire service, Sir Noel mentioned the use of reverse radiation by listeners in certain countries. In some cases, he said, it had recently been found desirable to use reflectors to prevent "echo" effect caused by waves reaching a receiver from the two opposite directions not quite simultaneously. The result was that each individual sound was reproduced twice, with a very slight time-lag amounting, for example, to perhaps one-fourteenth of a second in India. A reflector prevented that and, at the same time, increased the strength of reception in the main direction by about 35 per cent. in practice.

The research carried out in connection with short-wave aerial design and the determination of the optimum angle with the vertical at which the waves should be projected into space was referred to, and some details were given of the new aerial system and transmitters which were expected to be in operation early in 1937 and to effect a marked improvement in reception overseas.

A brief description of the working of television was given, and Sir Noel said that for the transmission of high-definition television the modulation-frequency spectrum went up to something of the order of 2,000,000 cycles per second; that was to say, at least two hundred times that required for sound broadcasting. Results of field-strength surveys round London were given and the effects of interference referred to.

Further B.I.F. Functions

Points from the speeches at Birmingham

NOW that closing time for the Fair at Castle Bromwich is very near at hand exhibitors and their representatives are resuming their annual conversations on those questions which have been ever-recurring for the past ten years and more. Is the date right? Is the place the best that could be found? What can we plan so that the next show will be more successful than this one? And so on. No doubt the Exhibitors' Committee will think all of these and many other matters over before long. Our own inquiries lead us to believe that generally speaking exhibitors are very satisfied with the results obtained up to the time of writing. Inquiries have been more numerous and they have been of a more serious type.

Some people ask, "Why doesn't the electrical industry hold an exhibition of its own?" Mr. T. R. Martin says that the Electrical Section must have more space in order that it may be more truly representative and that the cost of making a display should be less. It is not so much an extension of buildings that he seeks as a better concentration of the exhibits in the available space and an improvement of the exterior of the buildings. There seems to be general agreement that improvement in accommodation for visitors is an urgent necessity, but that is a problem for hotel proprietors as the show only lasts for eleven days.

Water heating exhibits have come in for special popularity on a number of stands this year, and so have electric fires; overseas buyers have shown an interest in lighting equipment and particularly in Coronation floodlighting devices, but some exhibitors think that Coronation equipment should have received a greater emphasis than it has this year. Domestic appliances have been in steady inquiry, particular attention being paid to thermostatically controlled and coloured cookers. We came across quite different views on different stands regarding the popularity of the imitation coal fire; some report a falling off in interest and others a growing demand for "visual effects."

Commenting on the first week's results of the Fair, Mr. J. Percy Plant, chairman of the Board of Management responsible for the Birmingham Section, said that they could now see that they had at Castle Bromwich something greater than an exhibition. The Fair had, and must in the future have, a special and clearly defined place in our national life.

The growing interest of women in matters electrical was demonstrated on Thursday last week by the number who attended the Fair for the official visit of the Electrical Association for Women. The Royal Dining Room was scarcely large enough to hold the three hundred and fifty or so who were present at the tea organised by the Birmingham and Midlands Branch and presided over by Councillor Mrs. Garrard, chairman of the branch. After a short address of welcome by Alderman Gelling on behalf of the Birmingham Chamber of Commerce and the Fair Management Committee, a special meeting was held at which a resolution was passed to inaugurate a new Central England Area Federation of the Association and to appoint Councillor Mrs. Hyde chairman and Mrs. Norman Griffiths secretary.

Trade with Russia

Last Friday's official visit of the Association of Mining Electrical Engineers was somewhat overshadowed by the presence at the Fair of the Lord Mayors, Lord Provosts and Mayors of nearly fifty boroughs as well as the Soviet and Chinese Ambassadors. At a luncheon given in their honour Mr. G. Philip Achurch, president of the Birmingham Chamber of Commerce, presided. Responding to the toast of "The Guests," M. Maisky, the Soviet Ambassador, praised the Fair, and said that visitors from all over the world could profit, not only by the trading opportunities offered, but also by the study of the wonderful lay-out and presentation of the industries and products. His country aimed at self-sufficiency only in order that it should be able to provide all its requirements in an emergency. Unless this emergency arose the U.S.S.R. would steadily develop and strengthen its trading contacts with the rest of the world, particularly with Great Britain, as the £10,000,000 credits arranged last year proved.

The Lord Mayor of Leicester, Councillor A. H. Swain, who also responded, complained that manufacturers were not making full use of the Export Credits Department.

Speaking as guest of honour at a civic banquet held on Friday, the Chinese Ambassador to Great Britain declared that the present need of China, in view of her extensive programme of industrial development, was above all heavy industrial equipment. Great Britain need never fear that demand would be smothered by over supply in China or that the growth of factories for the production of this class of equipment and the development of skilled mechanics need ever end the profitable co-operation of Western nations.

Mr. Frank Forrest, president of the Incorporated Municipal Electrical Association and chief engineer and manager of the Birmingham Electricity Department, proposed the toast of "The Electrical Industry" at a luncheon held on Saturday on the occasion of the official visits of the Electrical Power Engineers' Association and the Electrical Association for Women (Demonstrators' Circles).

The keenness and driving force shown by the large attendance at the Fair would, said Mr. Forrest, play a big part in the development of the electrical industry. Sales of electricity were increasing at the rate of 12½ per cent. per annum, in other words being doubled every seven years. It was no longer possible to sit down and wait for sales. The Electrical Association for Women, which was doing so much to increase the use of electricity in the home, had a scheme for training saleswomen, and he suggested that the E.P.E.A. might well introduce a similar scheme for its own members. A real training was necessary for selling, and it was not sufficient to use pedantic terms to sell electricity.

In response, Miss Caroline Haslett, director of the E.A.W., commented on the marked improvement in the design and appearance of electrical apparatus. Many of the cookers were streamlined and very attractively coloured, and she looked forward to the possibility of kitchen planning in the not very distant future. Replying on behalf of the E.P.E.A., Mr. H. J. Cox, president of the Association, appealed to all members to qualify themselves in such a way as to give the greatest service and to make themselves self-constituted salesmen for the purpose of inducing anyone they came into contact with to become electrically minded. Manufacturers had got to get right away from the residual-heat hot-plate and produce one with visual heat that was off when we wanted it off. He wondered whether it was right to make a profit out of consumers in outlying districts by charging them higher rates for electricity than prevailed in the towns.

The Importance of Research

Mr. H. M. Drake, president of the Electrical Contractors' Association, was the principal speaker at a luncheon held on Tuesday on the occasion of the official visit of ten of the most important electrical associations.

Mr. Drake, in proposing the toast of "The Electrical Industry," said that since the Industrial Revolution a century or more ago development had been extremely rapid, but it was nonsense for people to say that progress was tending to slow down, and as regarded electrical matters he could not think we had even begun to scratch the surface. Research was going on and something new came to light every year. Although enormous strides had been made since the war, the efficiency of generating electricity was still comparatively low and the method of converting the energy could not surely be considered to have reached finality.

Picturing the house of the future, he suggested that the staircase might disappear and give place to a lift, and that artificial lighting would come from shutters drawn across the window openings and containing powerful artificial daylight lamps. The right method of heating was a low-temperature wall-panel system. Ventilation matters were far from settled, while in offices electrical apparatus would be introduced to bring work on to more mass-production lines. All these new developments would come as a result of research work by manufacturers and as a result of showing apparatus at exhibitions such as the B.I.F.

He felt very strongly on the subject of research work and he considered that all prices should include something in the overhead charges to cover research work. Profits made in the industry should be retained in the industry and not used for other purposes. Progress was only possible if every section of the industry collaborated. The Fair Trading Policy should bring this about and might become a real force. There were very good brains in the industry but they were being wasted. A dictator would settle the main points of difference in five minutes.

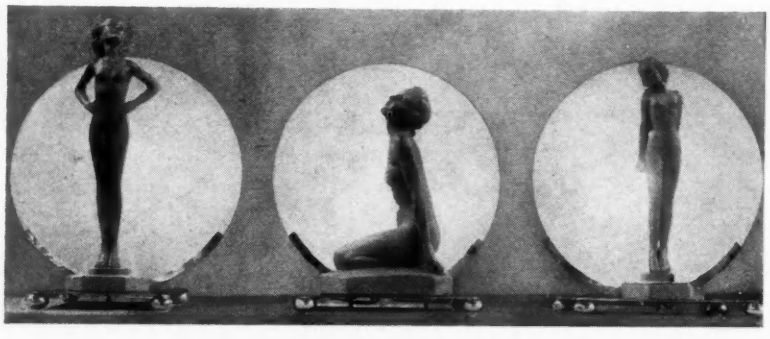
In responding, Dr. A. H. Railing agreed with Mr. Drake's remarks and said the desired state of affairs could only be brought about if we applied the whole of our energies properly. The Fair itself was an example of what could be done by team work. It was not always realised what was done in research work; for instance, nearly a million pounds had been spent in switchgear research alone. With regard to the Fair Trading Policy, manufacturers, wholesalers and electricity supply undertakings should remember that they were members of one industry and that they were dependent on the welfare of the whole for their share. Any efforts to obtain an unfair advantage would be detrimental to the whole industry.

Electrical Displays at the British Industries Fair

1. English Electric Co., Ltd. 2. Chloride Electrical Storage Co., Ltd. 3. British Electrical Development Association. 4. Coventry Refrigerator Co., Ltd. 5. George Bray & Co., Ltd. 6. Metropolitan-Vickers Electrical Co., Ltd. 7. Cable Makers' Association. 8. Hotpoint Electric Appliance Co., Ltd.

A Last Look Round the Fair

BESIDE discovering further interesting exhibits in the Electrical Section of the Fair at Castle Bromwich, we have, since last week, had an opportunity to make excursions farther afield to the Engineering, Building and Hardware Groups, where quite a number of electrical items, particularly those of domestic applications, are to be found.



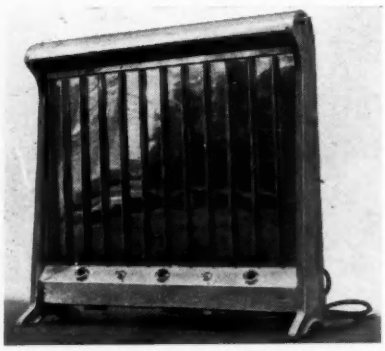
Lighting fittings by E. & J. Leek, Ltd. [*Elec. Rev. photo.*

With municipal hire-purchase schemes particularly in mind, Mr. W. D. Jones (Coventry Refrigerator Co.) has evolved an exceptionally compact 3-cu.-ft. model only 36 in. high, 24 in. wide and 19 in. deep, which is to be sold at 22 guineas, easily the lowest price at the Fair. This machine, the "Percold," can be supplied in any plain or mottled enamelled finish with black and chromium trimmings, and a porcelain enamelled flat top provides handy table space. Its direct-coupled motor and compressor are really noiseless and a novel automatic switching device obviates damage to the motor if by any chance a fault should develop in the compressor. A nine-point automatic control is incorporated and with electricity at ½d. per kWh it is claimed that the machine costs only 3d. a week to run. An inset model is available at an even lower price.

The Coventry Refrigerator Co.'s 3-cu.-ft. "Percold" refrigerator

On the stand of Williams (Birmingham), Ltd., we noticed among an extensive range of aluminium ware a new 3-pint kettle incorporating one of the new Bray loop-rod elements.

Streamlining is in demand and W. T. French & Sons, Ltd., can congratulate themselves both on the attractive appearance and the comfortable all-bakelite handle of their new "Mysto Non-shock" iron. In the more elaborate models, the prices of which are very moderate, are incorporated a calorimeter indicating the correct heat for various materials and also an automatic switch in the handle which cuts off the electricity when the iron is stood on its heel. Recessed thumb rests are provided on both sides of the handle and the sole is specially designed to facilitate ironing under pleats and around buttons. The loading of the iron, which weighs 5½ lb., is 500 W.



[*Elec. Rev. photo.*

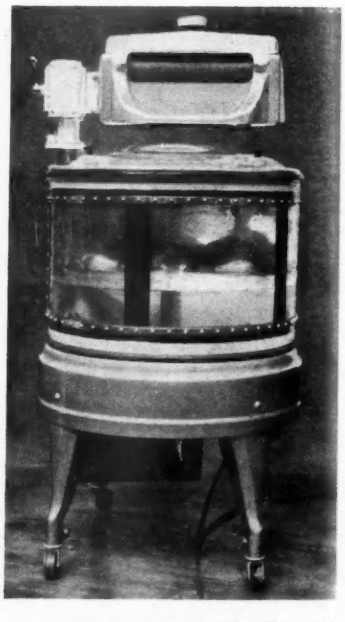
"Biheat Duplex" combined convector and radiator (Bertram Thomas)

Table lamps embodying statuettes and silhouettes are often regarded as something rather beyond the purse of the average person. Visitors to the Fair are quickly disillusioned by an inspection of E. & J. Leek's stand, where among a collection of novel fittings of all types with prices from 3s. 6d. upwards, are to be found any number of figure designs in jade, chinaware, chromium-plate, &c. The Falcon Plate Works offers a similar range of designs at prices between 2s. and 10s. In many cases candlesticks are available to match and a few of the latest models incorporate clocks. This company also specialises in imitation Lalique ware.

Strong & Co. tell us that their new "Stronlite" battery-operated table or hanging lantern is attracting a good deal of attention. It is sturdily constructed and supplied in a wide range of colours and designs. A battery-operated occasional lamp, which is automatically switched on when an arm holding the bulb is pulled down, is another new item shown by this company, which, besides doing business in flood-lighting equipment and solid bronze standards and wall brackets for country houses, inns, &c., has just entered the box sign market.

Apart from its business in general electrical accessories and lighting fittings, which include special designs for aeroplane and ship use, Clang, Ltd., is now marketing an improved type of gas lighter. Bakelite insulating parts at both the nozzle and battery ends eliminate any risk of short-circuits and a circular switch makes contact no matter in what position the nozzle may be. By using a special low-consumption filament which the company makes, the battery will give approximately a thousand lightings.

What is claimed to be the only rectifier plant on the market suitable for welding sheet metal of 22 s.w.g., is shown by Philips Industrial. The incorporation of an oxide cathode rectifying tube eliminates current surges (which lead to sputtering, sticking and breaking of the arc) and gives an easily flowing controllable arc. The current regulator is incorporated in the transformer. The plant, which measures only 16 in. by 22 in. by 24 in. and weighs 120 lb., is especially useful to the garage proprietor, since, in addition to its uses for welding, it may be equally well employed for battery charging. For the latter purpose it has a charging range of 10 to 40 A and is suitable for charging eight 12-V or sixteen 6-V batteries. A full range of oxide cathode rectifiers for factories, auxiliary lighting, electro-medical work, &c., is also available. None of the Philips cylindrical condensers for industrial purposes, which are available from 1 to 120 kVA, has a diameter greater than 8¾ in., those up to 16 kVA measuring only 4¾ in.



[*Elec. Rev. photo.*

A demonstration model of the MacGregor and McCallum "Magic" vacuum-cup washing machine

The safety as well as the output of pressing machines is increased by the new "Littell Air Blast" ejector demonstrated by J. Broughton. It is applicable to any pressing up to 5 oz. This company's new "Grippa" machine hand guard covers the whole width of the machine but allows more room for the operator. It is positively driven and the area which catches the hand is very extensive.

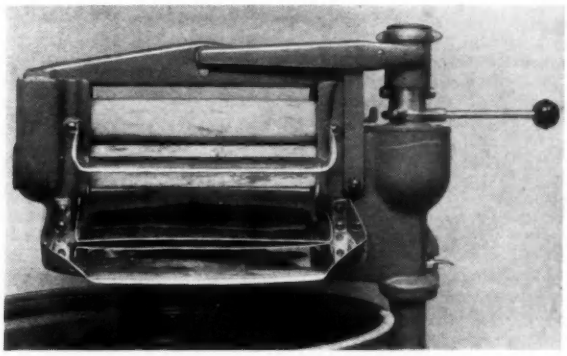
On the stand of Cellon, Ltd., is to be seen an interesting specimen of a pressing made and finished in one operation from sheet metal previously finished with one coat of "Cerrux" synthetic lacquer stoved for 50 min. at 250 deg. F. There was no sign of chipping or flaking and we were told that this lacquer is now being used extensively for meter cases, switchboards, motor lamps and refrigerators, as well

as for lighting fittings and glassware. It is available also in air-drying types.

Mica and mica elements for every electrical purpose are available from W. R. Small, while E. Rudd & Co.'s stand indicates its extensive business of supplying nameplates to all sections of the electrical industry.

Canada, which can claim a large share of the credit for the growing popularity of the electric washing machine in this country, has among its Government's exhibit three sections devoted to domestic laundry equipment. Beatty Bros. have a representative display of apparatus and we watched with interest MacGregor & McCallum's demonstration model which shows the vacuum cup action of their "Magic" machine. Meshed gears and a lever for "switching on" the pressure make the extra-wide new wringer fitted to the Hurley Machine Co.'s "Thor" washers "more foolproof than ever." The marble-coloured rollers attract the attention should the wringer be left running. An automatic draining tray is provided. In the Electrical Section the Speedway Suction Washer Co., Ltd., told us that its hand-operated washing machine can be supplied with an electric heater.

The successful combination of convection and radiant electric heater is the aim of many manufacturers. Bertram Thomas have made several alterations to their "Bi-heat Duplex" heater placed on the market last year, and the new model, beside being more efficient, presents a neater appearance. While retaining the 2-kW loading three elements are incorporated instead of two, and the introduction of a chromium-plated front with eleven vertical baffles provides a much larger radiating surface. The temperature of this radiant panel is kept low in order to minimise risk of scorching adjacent objects. The convected heat is obtained by passing air through the elements (in the base) up inside the casing and out at an opening in the top. Neon lamps indicate when the elements are switched on.



[*Elec. Rev. photo.*

A new type of wringer fitted to "Thor" washing machines (Hurley Machine Co.)

Seen at the London Section

ALTHOUGH there is no official electrical section at the London B.I.F. many electrical novelties are to be seen. For instance, there is a new table lamp by Better Vision Products designed to direct the light upwards on to a reflector and from which it is diverted downwards as even glareless light. A novel bedlight by 20th Century Electrical comprises a metal casing: when the flap is lifted up the lamp is automatically switched on; while on the Crayonne stand is an all-moulded revolving bedlamp.

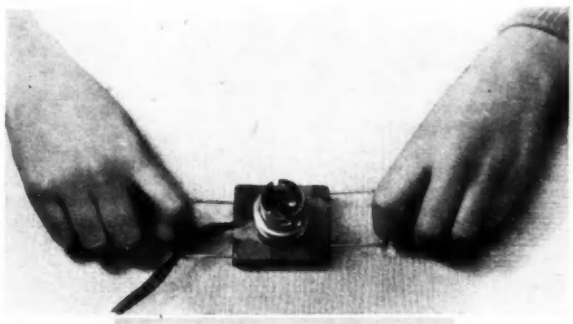
A revolving lampshade is the centre of attention on the stand of Livermore & Knight, Ltd. It is caused to revolve by rising hot air from the lamp deflecting vanes attached to the top of the shade. Clock lamps are a speciality by the Walker Fender Co., who have also introduced a combined barometer and lamp. Philip S. Schulman, Ltd., have gone one step further by making a table lamp combined with both clock and barometer. An arrangement of inkstand, calendar and table lamp is made by Wilcox & Pitman, Ltd., who are also showing a table lamp with a ball joint.

Among the electric clocks is a range of domestic models by Smith's English Clocks, Ltd., fitted with new movements at a price to compete with low-priced American types. Woodfyt Sales show an entirely new range of modern designs, and the London Electric Clock Co. is creating interest on its stand by a display of a kit set clock for the home builder. Striking table standards in a wide variety of polished woods are a speciality of Mallinson & Eckersley, Ltd., the most interesting being a standard comprising a base and lampholder connected by a flat piece of polished wood set at an angle; into this, we understand, an electric clock will be fitted. Crowds are to be found round the Baird stand to view the company's television set in action, and a good deal of interest is being displayed in the electric razor of Norma Technical Products, Ltd. A working model of the new "Goblin" washer shown by the British Vacuum Cleaner & Engineering Co., Ltd., has a glass container to show the action; it is one of the smallest washing machines on the market, holding 6¼ gal. of water and 5 lb. of clothes. The Fair has been used by Bylock, Ltd., as an opportunity to introduce a new de luxe vacuum cleaner, a bakelite hair dryer, a floor polisher, and a hand dryer. British Electric Domestic Appliances, Ltd., exhibits its "Model M" gyratory washing machine and its lower-priced "Model B."

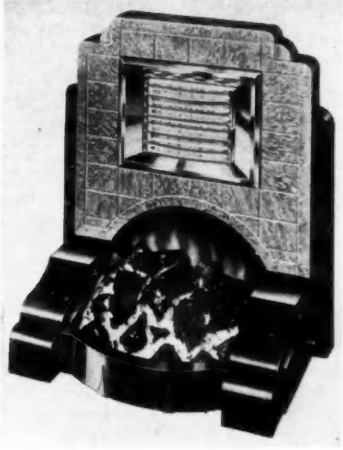
There are few electrical Coronation decorations, apart from table lamps bearing a crown or design on the shade, but a special feature is being made by Knightshades, Ltd., of shades, flower brackets, bowls and window-box devices, etc., in Coronation colours and designs. An interesting novelty by Electric Art Shades is a "Clip-it-on" fitting, a lampholder (with flex) attached to a spring clip enabling it to be fixed to any jar, vase or bowl for illumination.

The only electric fire which we saw was on the stand of H. E. Ashdown, Ltd. (moulders): this was a "Supremus" model with a moulded frame. Combined plug and lampholder adaptors, with adjustable pins, from 5 to 15 A, are also on show here.

A noticeable change at the White City is the appearance of several lamp standard firms in the Furnishing Section. One, at least, was at Birmingham last year, but considers the Furnishing Section a more appropriate place.



Left: The "Better Vision" table lamp. Centre: The "Clip-it-on" lampholder. Right: A new Walker Fender clock lamp. Below: The "Supremus" bakelite fire



Meetings and Discussions

Air conditioning in buildings is a subject of growing importance in which electricity will duly play its part. At the Institution of Mechanical Engineers last week Mr. E. R. Dolby dealt with the production of ozone for the purpose. This week's I.E.E. paper, by Mr. H. Diggle, covers the construction and operation of transformer on-load tap-changing gear and emphasises the necessity for arranging for easy maintenance without disturbing the transformer itself. "Treeing" and wax formation in paper-insulated cables were described by Professor R. O. Kapp in a recent lecture before the Junior Institution of Engineers.

Ozone for Ventilating

VENTILATING modern buildings by means of conditioned air is the subject of a paper by Mr. E. R. Dolby (consulting engineer) which was read before the INSTITUTION OF MECHANICAL ENGINEERS in London on February 19th. The author gives quantitative data, outlines the method of treating the air and describes the equipment employed. The main intake and exhaust fans are motor driven, while some types of filter also need fans, and water circulating pumps are motor driven too.

In some cases it may be worth while to add ozone to the conditioned air to replenish the oxygen. For this purpose the mains voltage may be stepped up to several thousand volts by transformers. One American type of ozoniser has an outside aluminium casing with numerous sharp points projecting inward and nearly touching a thin glass cylinder, the interior of which is copper plated. The air to be ozonised is passed through the space between the outer electrode and the glass cylinder.

Another type of ozone generator is made up of a number of closely packed units, consisting of mica or micanite plates placed vertically. At each side aluminium alloy gauze electrodes are supported by a frame of the same material, the whole acting in a similar way to a Leyden jar. The high-voltage discharge takes place across the very small air gap between the gauze and mica. The generation can be regulated between 20 per cent. and full output by means of a switch. In ordinary buildings it suffices if 0.5 per cent. of the whole of the conditioned air is passed through the ozoniser, the actual proportion depending upon the degree of vitiation. With electricity at 1d. per kWh about 600,000 cu. ft. of air can be fully ozonised for 1d.

Apparatus of this kind, complete with electrically driven fan, has been fixed to the roof of the underground passages in South African gold mines with very satisfactory results. These mines are very wet and deep, so that their atmosphere has to be improved. The sale price of the mining type outfit is £270. Although its output is only 300 cu. ft. per minute, it suffices adequately to ozonise 20,000 cu. ft. of air per minute, diffusing so rapidly that its beneficial effects are felt up to distances of 1,000 ft. from the apparatus.

The author suggests that the provision of separate ventilation for the kitchens of all large buildings is well worth consideration. It need not include elaborate humidifying plant, but might well incorporate viscous filters and ozonisers, so as to enable the odours of cooking to be removed, but it would be essential to install hoods over all cooking apparatus.

Changing Transformer Ratios

APPLICATIONS and construction of transformer on-load tap-changing gear are described in the paper by Mr. H. Diggle (Metropolitan-Vickers Electrical Co., Ltd.) which was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London yesterday (Thursday).

Tap changing is a means of adjusting the line voltage of a.c. networks. It can be used for regulating d.c. systems with the aid of switches on the primary side of transformers feeding convertors or rectifiers. Standard gear has also been used with advantage for tap-starting large synchronous motors and rotary condensers.

It is not generally possible without considerable expense and difficulty to add tap-changing gear directly to existing transformers; it is usual to insert some form of booster or auto-transformer regulator in series with the secondary windings. But a system has recently been used in Germany (when a transformer is to be added to a group) which avoids the need for boosters, though it involves the provision of an extra set of bus-bars, whereby the single new transformer is fitted with a tapping section of sufficient sectional area to serve the whole group.

Features considered desirable by the author are that the tap-changer should be built as a complete unit to be bolted to the transformer tank, so that all parts are readily accessible without disturbing the transformer; and should be so placed and dimensioned that rail transport is possible with the tap-changer in position, thus avoiding erection work on site.

For maintenance there should be easy access to all essential parts. When there are separate arcing contacts they should be in a separate tank which can preferably be lowered for inspection without draining oil or breaking oiltight joints. Selector switches, which do not break current, require only infrequent inspection, but this is facilitated if an oil-tight barrier is fitted between the selector switch tank and the transformer tank, although this is sometimes difficult to accommodate when there are a large number of tappings and high-voltage tests have to be met. The motor driving gear should preferably be accessible from ground level, and all auxiliary contacts, &c., should be in accessible positions. Reduction gears should be totally enclosed and oil-immersed.

For the prevention of faulty operation schemes are to be preferred which do not overload the windings during a tap-change. Preventive reactors should be continuously rated unless completion of tap movement is ensured by stored energy, *i.e.*, springs, falling weight, flywheel, spring-loaded solenoids. A mechanical safeguard should be provided to prevent overrunning due to wrong connections of the limit switches or their failing to function. Mechanical, in preference to electrical, means of decoupling the motor should be provided to protect an operator when cranking by hand.

Except for the smallest sizes, three-phase motors are to be preferred, but satisfactory single-phase and d.c. motors, suitable for direct starting, are available.

Tap-changing gear which has been designed only to pass the British Standard 50-cycle tests by a small margin may be unsuitable when co-ordination of line and transformer insulation on a basis of impulse test voltages (which impose more onerous conditions) becomes accepted practice.

The essential difference between circuits for automatic and remote control consists in the inclusion of voltage regulating and time delay relays in place of the control switch. Types of relay for automatic control are described in the paper, which concludes by enumerating various precautions which operating experience has suggested to be desirable for avoiding faults in, and mal-operation of, component parts of the tap-changing gear.

Deterioration in Paper Cables

PROF. R. O. KAPP delivered the annual lecture by an honorary member before the JUNIOR INSTITUTION OF ENGINEERS on February 12th. He said that in use paper-insulated cables were subject to two types of change. The first, known as "treeing," was caused by the deposition of carbon from the oil on the surface of the paper in a thin layer, thus reducing its insulating qualities. The second and still slower process was the gradual thickening of the oil in patches, turning it into a substance like candle grease.

This formation was often, not always, accompanied by the evolution of gas consisting mostly of hydrogen. Although the grease was a good insulator, it was denser than oil and left spaces behind in which the paper was not properly impregnated. The increasing viscosity of the oil prevented its free flow during the impregnating process and the wax imposed a barrier which such of the oil as was still fluid could not pass. But for those slow processes and accidental injury or deterioration of the lead sheath there appeared to be no reason why paper-insulated cables should not last for ever. No cable failure had yet been directly attributed to wax formation.

These forms of deterioration were usually observed in cables worked at 33 kV or above, and so both were due to the chemical effect of electric stress in the oil and not in the paper, and were not a result of the direct force exerted by the electric charge in the conductor. This charge caused indirectly a more violent localised effect, which was due to bombardment of the oil molecules by electrons. When the impacts were violent treeing was observed; if less violent the oil molecules were only partially smashed and wax formation took place.

Voids free from liquid oil contained oil vapour, the molecules of which moved with an acceleration proportional to the potential gradient and the size of the void. The size of the void was related to the rate and nature of the deterioration. The effect was also varied by the pressure in the void, high pressure lowering the effect. The presence of voids could be determined by a power-factor measurement. Voids might be

caused in manufacture by the presence of a small quantity of air not driven out by the vacuum process of impregnation, though the modern manufacture ensured very thorough impregnation. Voids developed in service due to the cable expanding when heated on load; the lead sheath was stretched and did not return to its previous shape when the core contracted again, voids being left near the sheath and the stranded conductor. Also the oil was liable to drain gradually into the joint boxes, particularly on a gradient.

Improvements might be made by investigations as to whether some cable oils were less liable to voids than others or permitted smaller voids, since their size was likely to depend on the surface tension of the oil.

Noise in Amplifiers

TYPES of noise encountered in high-gain amplifiers are described in a paper by Mr. F. C. Williams which was read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 23rd as avoidable (due mainly to faulty technique) and unavoidable.

The latter arises from fundamental physical properties of the apparatus used and is of two kinds. Thermal noise is due to chaotic motion of electrons in the conductors forming the circuit. Electrons collide with molecules and suffer changes of velocity; the charge they carry renders this change of velocity equivalent to a change of current in the circuit, and accordingly gives rise to an effective e.m.f. in the circuit. A formula is given relating the mean square value of this "thermal" e.m.f. to the resistance of the circuit.

A display of electric vehicles by A. E. Morrison & Sons, Ltd., at the Birmingham Section of the British Industries Fair

Thermionic noise is associated with the passage of current through a valve. Electrons leave the cathode and are drawn across to the anode. The arrival of each electron at the anode corresponds to a small and almost instantaneous change in the charge on the anode. There results a small change in anode potential. The sum of all such changes due to the arrival of many electrons gives the anode a small alternating potential. An expression is given which relates the mean square value of the alternating anode potential to the mean anode current and the anode load impedance.

The noise output is evaluated, and is shown to be dependent on the band width of the amplifier. Several particular circuit arrangements are described, the relative importance of thermal and thermionic noise being discussed.

In television amplifiers and radio receivers employing first-stage frequency-changers, thermionic noise is usually all-important. On the other hand, the noise output of receivers in which the first stage is a straight amplifier is due almost entirely to thermal effects in the first tuned circuit. An expression yielding the r.m.s. signal/noise ratio is given, along with general recommendations as regards the best circuit arrangements and the best valve-operating conditions.

Electricity in Brickworks

THE costing and application of electrical plant in brickworks were dealt with in a paper by Mr. R. A. S. Thwaites (North Wales Power Co., Ltd.) which was read before the NATIONAL ASSOCIATION OF CLAYWORKS MANAGERS at Wrexham on February 17th.

The author pointed out that the use of electricity had been responsible for considerable advance in the technique of the brickmaking industry. Because it made possible exact measurement of power used it had led to more economic methods of working and the detection and elimination of losses which were previously unsuspected.

During the period of twelve years in which the author was acting as sales engineer to the Yorkshire Electric Power Co. he succeeded in persuading almost every brick manufacturer in the area to change over from steam or oil to electric power. In Yorkshire the semi-plastic or semi-dry process was employed, so that the pressed bricks went straight into the kiln and preliminary drying was unnecessary. In North Wales the plastic method was in general use and drying before firing was essential. In that part of the country, therefore, if displacement of steam by electricity was under consideration then satisfactory means must be found of drying the bricks in substitution for exhaust steam.

The author proceeded to show that drying by exhaust steam was not really so efficient as it might seem. He scheduled the various items that should be taken into consideration when estimating the cost of steam plant. He stated that the average charges for electric power were very closely in line with the cost of generating by oil engines. But there was the added advantage that consumption could be increased without worrying about generating plant extension and, moreover, when the load factor was below 15 per cent. the cost per kWh became very high when oil engines were used.

The replacement of a steam engine by a single motor was not recommended, as by splitting up the load a great deal of power otherwise lost in friction could be saved. Group driving was often best, as separate motors for individual machines would in many cases result in an unjustifiably costly installation. When the load factor was low a flat rate was preferable, with the option of changing over to a two-part tariff after a trial period. The power cost per brick produced was reduced by the employment of electricity, while other unforeseen economies often materialised. After conversion to motor drive a press had produced 10 per cent. more bricks per hour than when driven by a steam engine through line shafting, because the speed of the electric motor employed was constant.

The saving in space was very great, while auxiliary uses of electricity included battery trucks for moving bricks about the premises and for carrying them in and out of kilns, pyrometers for kiln temperature control and the automatic control of humidity when drying bricks.

Heating Agents Compared.—The relative advantages of coke, gas and electricity for heating were the subject of the Chadwick Public Lecture (Bossom Gift Fund) by Mr. A. H. Barker at the ROYAL INSTITUTE OF BRITISH ARCHITECTS in London on February 16th. The desirability of separating the main heating of a living-room from the local heating was stressed, so that the room could at all times be kept at a temperature five or ten degrees below that desirable for comfortable use, the additional degrees being raised by local heat. The supreme advantages of electricity for this purpose were emphasised, since the heating elements could be supplied in any form at any temperature and could be readily made removable and could be fixed temporarily at any point, a feature not possessed by any other means. The lecturer concluded by expressing personal opinions on the relative advantages of the fuels derived from a long series of careful experiments and observations in his own house and other buildings.

The Importance of the Lighting Load.—The value of the development of the lighting load was the subject discussed at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 15th. Mr. H. H. Long opened the debate and referred to the remarkable variations of peak incidence for various towns and the astonishing figures of consumption by large stores, hotels, &c. Mr. Long urged that as the electrical industry had grown from the development of the incandescent lamp and as lighting still represented the main source of revenue, although it might be but a fraction of the maximum load, it was deserving of much more favourable regard from supply engineers than it received considering that it would certainly bring into use a diversity of other apparatus.

The Batti-Wallahs' Society

The next monthly luncheon of this Society will be held at the Hotel Victoria, London, on March 10th (12.50 p.m.) when Mr. Frank Murphy, B.Sc., M.I.E.E., the principal guest, will speak on "A New Conception of Business."

Mr. M. Whitgift, the hon. secretary and treasurer, tells us that the tickets for the annual dinner and dance on March 19th are nearly all gone.

Municipal Enterprise in America.

By F. Johnstone Taylor

Seattle's cheap electricity from hydro-electric stations

IN America the urban populace is encouraged in various ways to take an interest in the municipally owned undertakings. The superintendents of electricity, water, sewage and refuse disposal plants welcome visitors; the "Walk In" notice prominently displayed takes the place of the "No Admittance" to which the Englishman is accustomed, and many municipalities go so far as to issue interesting and informative publications concerning their activities.

One issued by the City of Seattle provides the engineer and economist alike with some illuminating facts. This city, which takes an interest in the small electricity consumer, has 83,000 house connections to its mains and it sells them on an average nearly 1,100 kWh each, for which they pay just over £6 per annum. The average cost, therefore, is appreciably under 1½d. per kWh, while even the smallest consumers obtain energy at a maximum of 2½d. This city, too, is noteworthy for its street lighting. Not only is it the finest in America, but the 1,546 miles of streets are illuminated for an all-in cost, including replacements, of 1d. per kWh as against the average cost elsewhere of 2½d. As might be anticipated, considerable use is made of electric cookers and water heaters, which help to make the domestic load more profitable.

The large hydro-electric stations in the United States are for the most part operated by public supply concerns like the Edison group, but the Seattle municipality, in 1904, erected thirty-seven miles of 45,000-V overhead transmission line to bring to the town the energy of two 1,200-kW generators at Cedar Falls, on a small river to the south-east. In 1906 two 4,000-kW units were started there.

The immediate post-war era of commercial activity necessitated the speedy installation of steam plant having a capacity of 30,000 kW. This now functions as a standby and regulating plant, the real development being the acquisition of water rights on the Skagit River 200 miles to the north-east. Commencing at the lower point of the valley, which it is estimated will ultimately provide 1,120,000 h.p., the Gorge power house was started with 75,000 h.p. of plant, this can be increased when required to 320,000 h.p. by heightening the dam. With three units the plant was carrying 88 per cent. of the total load in 1934.

Large Generating Units

Additional plant now being put into operation is remarkable for the size of its units and the fact that it is municipally owned. The two sets being installed at the Diablo power house at the next convenient site up-stream are rated at 95,000 h.p. on a 310-ft. head at 171.5 r.p.m. when discharging 282 cu. ft. per sec. They are exceeded only in size by the 115,000-h.p. sets at the Boulder Dam. The working head is greater than the 270 ft. at the Gorge power house by reason of the 375-ft. high dam, though further dam construction at the latter plant is anticipated later to increase its output. The ultimate development aims at a third power plant upstream from Diablo and another dam, the latter partly as a means of regulating the whole valley and partly to create head for producing 480,000 h.p.

The authorities in Seattle appear quite confident of selling the energy produced by these huge machines and, of course, from the economic standpoint the plants are very favourably situated. Dams 300 ft. or so in height across these comparatively narrow rocky valleys involve no great difficulties; the available head is almost the ideal for such vertical shaft units.

Thus, with 120 miles of new steel-cored aluminium transmission line operating at 240,000 V, the whole electrical installation to date has not cost the city more than £2,400,000 for 160,000 h.p., which works out at about £15 per h.p. installed, while the project when completed is estimated to cost no more than about £13 10s. per h.p. installed when producing 840,000 kW on a 40 per cent. load factor with a mean flow of 3,500 cu. ft. per sec. Incidentally, as might be anticipated, the 74 in. of rainfall is very favourable and there is 1,235 ft. of fall available.

Tariffs and Finances

The cost of energy to small consumers has been reduced from 10d. per kWh in 1902 to less than 1½d. per kWh at the present time; to power users electricity is available at an average of a little over ¼d. per kWh, and the undertaking has an annual revenue of £1,800,000, of which by only taking a profit of 2¼ per cent. it is paying 31½ per cent. interest on capital and putting over 26½ per cent. towards depreciation with 14¾ per cent. as the distribution costs.

One criticism lies in the overhead distribution by 52,000 wooden poles serving 95,000 consumers. This, to English people, is crude and ugly, though it is more or less accepted in America as part of the price of cheap electricity. The distribution is by 26,000-V, 3-phase, 3-wire tie lines which feed a series of some twenty distribution stations by 26,000-V, 3-phase feeders, which also serve large power loads direct. From sub-stations the energy is transmitted at 2,400-4,160 V and, finally, regulated 4-wire, 3-phase primary feeders serve lighting at single-phase through 120/240-V transformers.

Industrial Research

The annual E.R.A. meeting and luncheon

THE annual general meeting of the British Electrical and Allied Industries Research Association was held at the Savoy Hotel on February 19th, Mr. A. Berkeley, chairman of Council, presiding. The formal business included a vote of thanks to Sir W. Larke, retiring president, proposed by Mr. C. C. Paterson and seconded by Mr. C. P. Sparks.

Mr. E. B. Wedmore, director, then spoke in amplification of the annual report (ELEC. REV., February 5th, page 206), referring particularly to E.R.A.'s contribution to the development of high pressure steam plant. More efficient generation had enabled the price per kWh to be reduced, thus stimulating greater use of electricity, which had caused more generating plant to be installed (for replacements as well as extensions), more coal to be used, and more domestic and industrial appliances for consumers to be sold. The benefits to manufacturers thus far exceeded their contributions to E.R.A.

Mr. C. P. Sparks eulogised the chairman's business and financial management of the Association, and the support received from all directions. Evidence of the confidence shown in E.R.A. was the continued support of the Department of Scientific and Industrial Research and the Central Electricity Board; the latter had made a second grant of £7,000 per annum for another three years.

Following the adoption of the report and balance sheet Mr. Ll. B. Atkinson was elected an honorary member of the Association. Mr. A. Anderson retired from the Council, together with Mr. Atkinson. Sir Leonard Pearce and Messrs. A. P. M. Fleming, A. E. Tanner and F. Wallace (due to retire by rotation) were re-elected. Col. Sir T. F. Purves, Dr. R. E. Slade and Mr. H. W. Taylor (new nominations) were elected to the Council.

At the subsequent annual luncheon, at which the attendance numbered about 300, Ald. W. Walker (the new president) occupied the chair. After the loyal toast "The E.R.A." was proposed by Mr. H. T. Young (President, I.E.E.), who drew the attention of those who could secure financial support to the foreword to the report, which stated that "knowledge cannot be gained without expense, but funds converted into 'knowledge stock' constitute a priceless national asset, which will repay in ever-increasing dividends of prosperity and progress the confidence of the broad-visioned and far-sighted investor."

Such facts as those should be made known throughout the industry. It should be somebody's job to tell the user what E.R.A. and other research organisations were doing, for users did not always appreciate how much went to the making of the appliances employed in factory and home. The research going on to-day within the industry made it unnecessary for the user himself to do the experimenting. Mr. Young concluded with tributes to the new president and the director and his staff.

Ald. Walker, in reply, emphasised that no other industry needed such constant and unremitting research as the electricity supply industry. Without research energy could not have been offered at the price at which it was available to-day. The increase in steam boiler pressures and temperatures had been made possible in an astonishingly short space of time, while an overall thermal efficiency of 29 per cent. and the production of one kWh from one lb. of coal were really remarkable achievements. While every means was being provided to enable them successfully to compete with every other form of power, the industry as a whole was not doing its duty to E.R.A. Some people seemed to think that the results obtained were not "near" enough to warrant support. That idea must be dispelled and everyone made to realise his own need to contribute. Ordered and sustained effort was the only way in which research could be done properly so as to obtain results in a reasonable time and at a reasonable cost.

Mr. A. Berkeley proposed "The President," to which Ald. Walker responded briefly.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Compulsion for Contractors

Recently called in to correct trouble at a local store I found many things hardly in accordance with good practice. The total load was in the neighbourhood of 100 A controlled by a 60-A switch-fuse, with 19/.052 l.c. main cables almost too hot to bear handling. Fuse carriers could only be removed by using a cloth. One busbar of the ten-way 5-A dis. board was actually glowing dull red. The rubber was perished and cables were bare 4in. from the busbars. The main cables and twelve pairs of l.c. sub. cables were chased into a wall and plastered over with no protection. I found twenty-two 100-W lamps on one pair of 3/.029 cables; window reflectors fitted with bakelite holders, wired with two 3/.029 l.c. cables looped from reflector to reflector; heating cables simply twisted together and lapped with adhesive tape; and many other things like this.

The job is four years old with later extensions. All the work was carried out by a firm on the National Register. Of what value is registration? UNREGISTERED COMPETENT.

February 15th.

Testing Prepayment Meters

The method of testing prepayment meters fitted with fixed charge collectors which is described by Mr. V. H. Tregoning in your issue of February 19th is probably the simplest and best. Unfortunately I had not a number of synchronous clocks at my disposal, and the system I adopted was designed to operate satisfactorily with one clock only.

Mr. J. Rayner advances several criticisms of my system, and puts forward a method of his own which is claimed to "overcome these obstacles in actual practice." His two chief objections appear to be that the load comprising shunt coils and synchronous motors is actually metered by the elements under test, and that when a meter switch has operated the meter will continue to run into debit, after short circuiting the internal meter switch.

Mr. Rayner quotes the VA loading of the instruments in order to show that they will register under the conditions outlined. Since the meters are watt-hour meters the VA loading is no criterion in deciding whether or not the meters will register. In point of fact, the meters may or may not register, according to the number of meters connected. That they may be prevented from registering by inserting a paper wedge under the discs was regarded as a simple expedient, too obvious to mention.

With regard to the possibility of a meter running into debit, I should point out that after a meter switch has opened, all meters are stopped until the operator has time to attend to them. When it is observed that a particular meter is at zero credit, as indicated by the glowing pilot lamp, the test on this meter may be regarded as finished, in which case the motor is disconnected, or another coin may be inserted and the test continued. The meter is never allowed to run into debit.

Referring to Mr. Rayner's diagram, it is difficult to understand any basic difference from my own, except that double-pole switching is adopted in order to short-circuit the meter and pilot lamp, or alternatively to connect and disconnect the synchronous motors from the source of supply. I assume that the normal position for the double-pole switches is that which connects the motors to the supply. I would also like to point out that when the meter switch in the meter on the extreme left of his drawing has opened, his clock has no supply, so that if this meter is the first to operate, the whole arrangement is unworkable. I fail to see how Mr. Rayner prevents registration of the meters electrically, as according to my reading of his diagram, the load current for the synchronous motors passes through the series winding. J. BAILEY.

Barnoldswick, *February 19th.*

The Contractors' Proposals

I read your leading article of February 5th with profound and thoughtful interest. Having worked with large and influential London supply authorities for twenty-one years, the suggestion that supply authorities should no longer undertake wiring installation work, or sales of domestic electrical appliances, is one on which I should like to present my point of view.

Undoubtedly sales departments are only useful and efficient because they are an integral part of the supply authority. Consumers and electrically-minded people who are desirous of acquiring practical knowledge of domestic and commercial apparatus consider that a supply authority's showroom is the right and reliable source of the information they are anxious to obtain, and consequently it would seem a mistaken policy to prevent inquirers being given this information by a competent sales staff.

In the past these showrooms have been regarded somewhat in the light of an advertisement and primarily for the service and convenience of the company's consumers, and it seems very desirable that the public should know that any help or information wanted is immediately available. A potential consumer prefers to be advised regarding proposed installation work by a supply authority's official and feels more satisfied that work carried out by the authority will be done in a thoroughly reliable manner. So much shoddy work has been done in the past by contractors who are not members of the E.C.A. that one would think the supply companies, the E.C.A., and the E.D.A. should be able to evolve a satisfactory workable scheme by which showrooms already in existence, and giving the public the help

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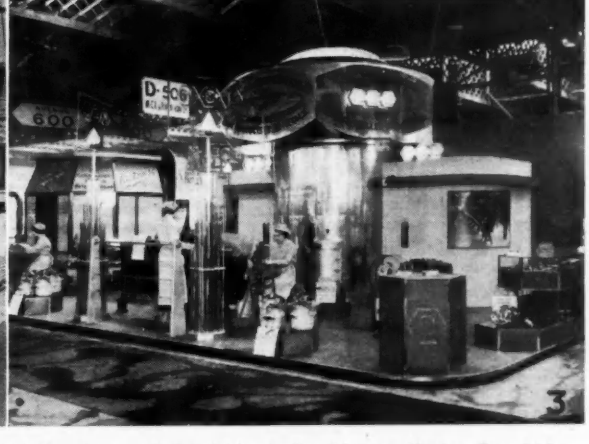

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Some further stands at the B.I.F., Birmingham. 1. Donald Macpherson & Co., Ltd. 2. Brookhouse Heater Co., Ltd. 3. M.C.L. & Repetition, Ltd.

and information it expects, should be able to run satisfactorily; to close them down would not be wise or advisable.

The large sales staffs employed by supply undertakings would view with dismay any such drastic change as that suggested unless the E.C.A.'s intention is to take over showrooms and staff *en masse*, which would seem the ideal solution.

If the scheme that E.D.A. is now launching for better trained sales staffs and the closing down of all supply companies' showrooms became effective, the specially trained salesmen would be redundant before they received their diplomas.

London, W.4, *February, 16th.* MABEL G. READING.

[We did not understand Mr. Drake to propose that contractors should take over supply authorities' showrooms.—EDS., ELEC. REV.]

Recent Testimonials

I heartily endorse all that "Inquirer" and Mr. E. S. Weeks have said. After eighteen years' continuous employment in the electrical contracting industry, and having been with my present firm for about ten years, I find the same difficulty when trying to improve my position.

There is another point about these advertisements, however. For some vacancies advertised a university degree or its equivalent is stipulated when often it would be infinitely better to employ a first-class *practical* electrical engineer. I do not propose to tender advice to employers, but if supply authorities, for instance, were to employ men of this type as electrical inspectors or consumers' engineers we could say farewell to the botched work carried out by themselves, and so set a higher standard of work as an example to the small man. We should see a proper layout of the service equipment (which is nearly always an eyesore) and all gear would be upright, neatly run and securely fixed. I have a cooker and water heater wired by the local supply company in my house, so I know what I am talking about. As I have always been engaged on first-class work, it brings tears to my eyes; the workmanship and layout are appalling. Such installations are passed by an inspector, either an A.M.I.E.E. (who often does not know a bad job from a good one) or by someone who has always been engaged on shoddy work.

Yet there are many men like myself who have served a seven-year apprenticeship with a first-class London firm, studied at evening institutes, worked as fully qualified electricians, and have then become charge-hands, supervising large and intricate installations employing only the best workmanship and modern methods. A few firms have tried the experiment of taking men of this class into the office as estimating and supervising engineers, and these firms are finding it a profitable proposition.

Often, of course, the salary offered is too low. The practical installation engineer will not give something for nothing. Experience is not cheap. Often sacrifices have had to be made, and if employers want a good article they must pay for it. Some men with degrees may offer their services for £150-£200 per annum, but not the man who knows his job.

February 15th. G. S. W. G.

The Future of the Tramways

Regarding the relative advantages of buses and electric trams, I thought the proposal of your correspondent Mr. Jackman a very good one. The trams will eventually have to be removed from the surface roads, but buses will not necessarily take their place, because they cannot deal with the heavy traffic.

In Liverpool roads are railed off and the tram lines are laid on sleepers in the outskirts, but we still have traffic troubles in the centre of the city. Mr. W. Rivitt believes that the buses could not be run as cheaply as the trams, such as six to eight miles for 2d. It has been proposed in Liverpool, in order to avoid a transport rate, to raise the fares for the trams only. Our cheapest run is about six miles for 2d., which would become 3d., and the penny stages would be shortened to an average of 1¾ miles; even then the fares would be considerably lower than those usually charged on buses.

The traffic problem in Liverpool at the peak hours is very serious (though I suppose not more so than in other great cities) and hundreds of passenger fares must be lost through inability to cope with the traffic.

Most of the tram routes spread out in the shape of a fan and meet again at one or two points in the suburbs, and a subway running from the centre of the city, such as that suggested by Mr. Jackman, is just what is wanted.

The L.M.S. runs across the district some miles out but caters very little for the traffic; and the Cheshire lines are farther out again. With reference to Mr. Ford's remarks, for cities like Chester with narrow streets buses are ideal, but where there is a dense traffic they will not take the load. A tram inspector at Blackpool told me that he could not deal with the crowds if there were no trams, as these do not entail the difficulty in loading up and getting the people away that the buses do. A report or paper given some time ago by the manager of the Manchester Tramways stated that if people wanted buses they would have to have them, but it would be another thirty years before the trams entirely disappeared. CHARLES RETTIE.

Liverpool, *February 17th.*

[Since this letter was written the Liverpool Corporation Transport Dept. has estimated that there will be a substantial surplus this year, obviating the need for a transport rate.—EDS. ELEC. REV.]

One does not need to look far to realise how the decline of the tramways has come about. While in most of the smaller towns the tram has outlived its usefulness, in the larger towns more economical use can be made of it than of any alternative vehicle, given the necessary conditions.

In a recent address to a local branch of the N.A.L.G.O., Mr. W. G. Marks pointed out that it was impossible to make a general statement and that each undertaking had to consider its own particular circumstances. He remarked that those who cried "Scrap the trams!" "Run buses up the back streets!" "Use trolley buses!" "Construct a tube railway!" were not the users of public transport. This is perhaps true; but they might easily be members of a town's transport committee, one of whom recently stated that there would be no trams anywhere in ten or fifteen years, that the difference between old and new trams was merely a matter of upholstery and that new trams would cause fares to be raised.

Perhaps it is unnecessary to add that the cars on the system referred to are out of date (old ones have recently been bought from other undertakings) and that there are no modern trucks, upholstered seats, roller bearing axles, air brakes, regenerative control or any other method of improving appearance and performance.

February 16th. TONI.

Electricity Supply Finance

The article on this subject by "Accountant" in the ELECTRICAL REVIEW of February 19th moves me to write regarding another aspect of grid supplies not generally realised. Some time ago I received an inquiry for power supplies to a cotton mill. The power requirements may be stated quite simply as 600 kW at a 20 per cent. load factor, or, 1,050,000 kWh per annum. The annual cost of a privately-generated supply was given as £1,968 including capital and working charges, or 0.45d. per kWh. If my undertaking could get down to a similar price, the mill management was prepared to transfer its load to the supply authority's mains. The cost of incoming grid supplies, however, may also be stated in similar fashion, *viz.*, 600 kW of m.d. at £3 7s. 6d. amounts to £2,025, and kWh at the grid tariff to £960, a total of £2,985. Even at cost price the supplies could not compete for the business. After due consideration of all the pros and cons, I came to the rather startling conclusions mentioned below.

The mill would have to purchase its coal supplies at prevailing prices and would not possess any advantage over rival agencies. The coal would have to be hauled from the pithead to the mill bunkers *via* the undertakings of the railway companies, the agency of transmission being a steam locomotive operating at an efficiency not superior to 13 per cent. The coal would finally be utilised at modest efficiency by the private generating plant at the mill, and the overall result is a unit cost slightly below ¼d.

Now assuming that generating costs are equal between the selected station and the private generating plant—which is not the case, the savings favouring super-generation—and assuming also that capital expenditure is equal between the railway companies' undertakings and the "grid"—which again is not the case—and assuming, further, that the cost of power supplies to the mill, at cost prices of incoming bulk supplies, was equal to the cost of the privately generated supplies—which it is not, grid supplies being something like 50 per cent. dearer—then it follows that the efficiency of grid transmission is not superior to that of the steam locomotive, *viz.*, 13 per cent. Having regard, however, to the tremendous differences in price in the above instance, it would seem that the grid has no commercial merit worth talking about. Perhaps "Accountant" will oblige by treating us all to an analysis of the annual charges appertaining to railway undertakings and national grid transmission. It ought to provide most arresting reading.

Whitworth, Lancs, *February 19th.* JAMES RATCLIFFE.

Discharge Lamp Operation

I wonder whether any of your readers who have had experience in discharge lighting would favour me with information with regard to the following points:

I wish to ascertain the minimum starting current and voltage and, if possible, obtain a pressure and current curve from the time of switching on until full brilliance is attained. I would also like some information on the effect, if any, of temperature variations of the surrounding atmosphere.

February 22nd. L. T. P.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Small Time Switch

The most recent introduction by the NIVEX INSTRUMENT & GAUGE CO., 3-11, Pine Street, London, E.C.1, is a small programme and time switch. It is actuated by clockwork and can be set to operate at any period between 7½ min. and 11 hours from the time of setting. The switch is tested to 2,000 V and is suitable for 100/250 V, 5 A a.c. or 2 A d.c., thus enabling it to be used for small heating appliances, lamps, &c., as well as for radio sets.

The "Nivex" switch

Percussion Screw Driver

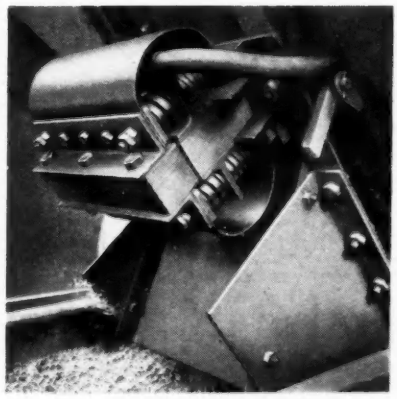
For driving screws into wood or metal more tightly than is possible by hand, or for removing screws that have become rusted in, MOSS'S AGENCIES, LTD., 12, High Street, Leamington Spa, manufacture a "Booster" percussion screwdriver. This is provided with two double-ended bits, each right and left hand, to fit varying widths of screw slot. The bit selected is fixed by a set screw on the knurled stock and used in the ordinary way. When the screw is tight the lock is released and the shaft is held against turning and struck with a lead- or copper-faced hammer. For withdrawing screws the right-hand bit is used.

Screws may be locked into metal by pushing the handle over the bit and striking the top of the stock with a hammer, when a punch forming the nose of the driver burrs the metal into the slot.

Electro-magnetic Vibration for Feeders

The electro-magnetic principle of operating screens and concentrating tables embodied in the "Sherwen" design manufactured by the Fraser & Chalmers Engineering Works (of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2), has now been applied to feeding and conveying, enabling material to be handled without any rotary power movement or lubrication. The feeder or conveyor need only be suspended from a structure and connected up to an a.c. circuit.

"Sherwen" feeders and conveyors of both the open-pan and the pipe type are available, having outputs of from a few pounds to 600 tons per hour and handling wet or dry material from fine dust up to over 15 in. in size in a continuous even flow. Power consumption is small owing to the use made of the natural periodicity of the spring-balanced moving parts, which are tuned into harmony with the electric pulsations from a half-wave metal rectifier. The only wearing part is the renewable conveyor lining (in the pan type).



G.E.C. electro-magnetic vibrator

The vibrating mechanism consists of one or more former-wound coils with stationary laminated cores connected in series with a Westinghouse half-wave metal rectifier. A moving armature, mounted on a cantilever steel spring, is connected by coil springs to the conveyor. Upon switching on, the armature and conveyor are drawn forward against spring pressure during the first half of the a.c. cycle. During the second half of the cycle the springs accomplish the return stroke. As the pulsating current closes and opens the air gap between the magnet and moving armature every cycle the speed of the moving parts of the conveyor on a 50-cycle supply is 3,000 cycles per minute. A rheostat gives instantaneous regulation of speed of travel along the conveyor, and the tonnage delivered by the conveyor or feeder can be varied by small steps from zero to maximum.

The vibrator can be arranged for remote automatic or hand control. Three sizes—for light, medium and heavy duty—are available. The control switch can be interlocked with the discharge gate to ensure that operation takes place only when the hopper is discharging. The vibrator can also be attached to the bottom of trays for making concrete slabs, to packing machines for increasing the contents of containers, and to chocolate moulds for eliminating air pockets.

A De-Luxe Vacuum Cleaner

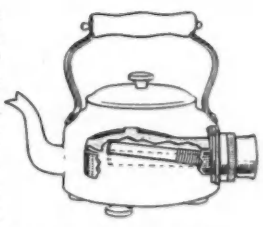
There is now a de-luxe model of the "Tireless Tim" vacuum cleaner of HOGAN & WARDROP, LTD., 25, Old Street, London, E.C.1. Its special feature is its quiet running; an interference suppressor is fitted and the loading is a little over 200 W. The model is supplied in a leatherette-covered cabinet with a flexible braided and armoured hose, straight and curved extension tubes, wide, narrow and upholstery nozzles, and wide and triangular brushes. The flexible cable is fitted with a combined plug and adaptor. A disinfectant sprayer and deodoriser can be supplied as extras.

The "Tireless Tim" de-luxe model

A Safety Kettle

Various kinds of safety cut-outs have been adopted for use with electric cooking utensils, but an entirely new departure has been made by the LONDON ALUMINIUM CO., LTD., Westwood Road, Witton, Birmingham, 6, in the construction of its "Diamond 550" kettle.

The element (1,750 W) is of the normal loop type, but within the loop is a float, protected by an aluminium plate. This float is normally tilted upwards; should the level of water fall to that of the element, however, the float falls to a horizontal position and breaks the contact. On the kettle being refilled the float rises again and the circuit is completed. The cut-out operates, of course, only when the kettle is boiling dry and does not switch off when the kettle boils.

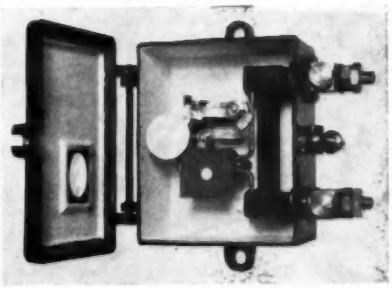


The "Diamond 550" kettle

The body of the kettle is seamless and made of stout gauge aluminium with a highly polished finish, although chromium finish can be obtained at a slight extra charge. The large lid and spout are welded on and heavy stamped aluminium supports hold the moulded handle. The knobs and feet are also mouldings. Equipment includes two yards of three-core non-kinking "Antishoc" flex, with kettle connector and earthing terminal.

An Earth Fault Indicator

For locating a faulty insulator on an overhead line without detailed examination and at a convenient time, ADAMSON, GREEN & CO., LTD., Sunderland Road, Felling-on-Tyne, have devised an automatic indicator, which can be observed from a distance with the aid of field glasses. The instrument is inserted in the earth wire on each pole and passage of current above a predetermined amount is shown by the dropping of a coloured disc behind a glazed window.



Earth fault indicator

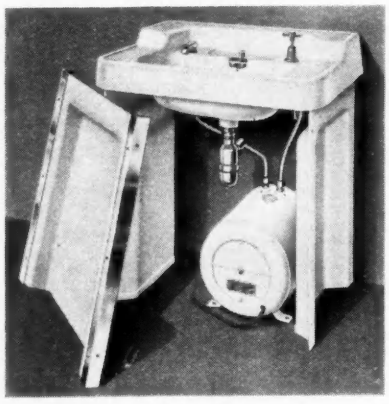
Damage to the relay by heavy currents is prevented by the use of a carbon shunt. The equipment is contained in a

D

weatherproof case and is arranged for insertion in existing earth leads. The upper terminal is insulated from the case, so that the earth lead from the pole top may be taken direct to the carbon shunt, and the outgoing terminal is in contact with the case and is therefore earthed. The instrument is intended primarily for use on wood poles but, where necessary, it can also be used on steel structures, the metal of which forms the shunt.

A Self-contained Hot-water Basin Unit

For positions where a self-contained hot-water basin unit is required M. COCKBURN & CO., LTD., Falkirk, have designed the "Lavalect," comprising a porcelain-enamelled cast-iron panelled basin and an electric water heater having copper connecting pipes and a chromium-plated mixing tap and delivery nozzle.



The "Lavalect" hot water basin unit

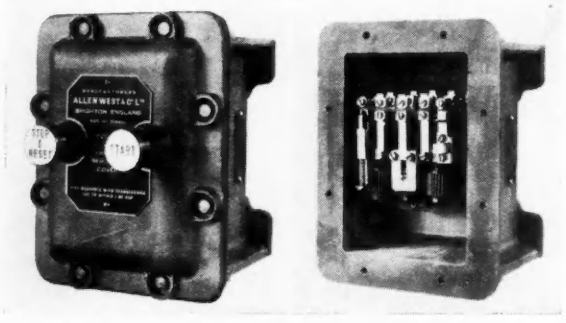
The heater is of the storage type, lagged and situated in an enclosed compartment underneath the basin. The mixer tap delivers cold water from the main, a mixture of hot and cold, or all hot from the storage tank, according to the control position. The whole of the connecting pipes are of light-gauge copper with patent compression joints, and an adjustable thermostat is set to maintain the temperature of the water continuously at 176 deg.

The rating of the heater, which has a capacity of 1½ gal., is 750 W, and the manufacturers state that it requires 66 min. to heat the water from 61 deg. to 176 deg., 800 Wh of electricity being used in the process.

Small Motor Starters

The latest addition to the range of starters made by ALLEN WEST & CO., LTD., Brighton, 7, is a special adaptation of type "SC1" to comply with B.S.S. No. 587 for hoseproof starters.

It is provided with a heavy cast-iron base and front cover with a machined flanged joint and a "Dexine" gasket. The



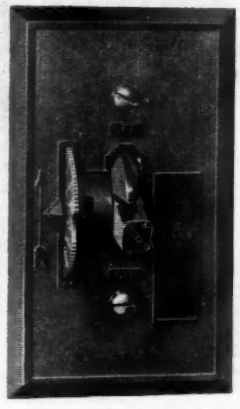
An Allen West type "SC1" (hose-proof design) starter for 7½-h.p. motors

push-buttons in the front cover are spring-loaded, specially packed and provided with grease rings, the complete interior being mounted between two mild-steel clamps.

The contactor is of the triple-pole type with a vertical double break per pole, a fourth pole being incorporated to maintain the operating coil circuit. All contacts are faced with silver. Adjustable magnetic overload releases with an adjustable oil dashpot time lag and restrainer device are incorporated, as is also a no-volt release.

Time Lag Switches

"Mark Time" time-lag switches are a development by GOODLIFFE ELECTRIC SUPPLIES, LTD., 8, Eagle Street, High Holborn, London, W.C.2.



A "Mark Time" switch for delays up to ten hours

These switches have been introduced from America and enable delayed lighting to be obtained from what appears to be a standard switch. When the toggle is depressed the lights come on in the ordinary way and stay on indefinitely, but when the dolly is returned to the "off" position the time-delaying mechanism comes into action, giving a delay interval of from three minutes to thirty minutes, each depression of the switch adding three minutes to the interval.

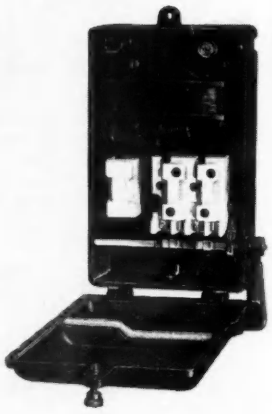
Other models are available giving 7 sec., 40 sec. and five-minute intervals. A safety lock can also be obtained. With this in action the toggle, when depressed in the ordinary way to bring the lights on, returns to the "off" position automatically. The time-delay mechanism comes into action immediately so that the lights stay on only for the time duration for which the switch has been set.

In all models the time-lag mechanism can be put out of action by a small lever, when operation becomes the same as that of an ordinary tumbler switch.

Special switches are also made for use with washers, waving machines, neon signs, radio sets, &c., giving time ranges of 15 or 30 minutes, one, five or twelve hours. A clock escapement is used for the time delay mechanism, and 5-, 10- and 15-A ratings are catered for.

Low-voltage Safety Lighting

In order to provide the necessary control and protection for low-voltage lighting circuits in a convenient form, the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is now manufacturing a combined transformer and switch-fuse unit, contained in a neat cast-iron case, which is suitable for mounting on a wall or other support. It consists of a step-down transformer with a secondary output of 50 W at 12 V and a d.p. q.m. and b. switch with china replacement fuses for controlling the primary side of the transformer. The latter is double-wound with an earth connection to the secondary winding, and its primary side can be wound for either 100/115, 200/250, or 400/440 V, the last being suitable for obtaining a lighting supply from a motor circuit where the ordinary lighting mains are not available.



The G.E.C. low-voltage transformer and switch unit

With a transformer of this size the output is so small that the primary fuses can only be used to deal with short-circuits and not overloads; overload protection is, however, very desirable, and this unit is therefore provided with a special feature in the form of a single-pole low-voltage fuse to protect the 12-V lighting circuit.

The cast-iron case containing the transformer, switch and fuses is fitted with a hinged cover with which the switch handle is interlocked.

A Small Heater for Car Radiators

The "Neeta" heater which has recently been introduced by ERNEST H. HILL, LTD., 66, Fitzwilliam Street, Sheffield, 1, is rectangular in shape and is provided with a hook for attaching it to a car radiator or the sides of cold-water cisterns, &c., to prevent freezing of the contents. The 80-W

The "Neeta" heater

element is wound on a mica former and is protected by metal gauze; a three-wire flexible is fitted, although a lampholder adaptor is attached. Other uses are in conjunction with airing cupboards and garden frames.

German Electrical Exports

GERMAN exports of electrical machinery and apparatus last year continued the recovery which was shown in 1935 and were also in excess of those of 1933. Their total value was 234,613,000 Rm., whereas in 1935 it was 206,343,000 Rm., in 1934 199,047,000 and 220,448,000 Rm. in 1933. In weight the increase was more marked, the total last year being 977,761 double centner (double centner=220 lb.) against 771,980 double centner in 1935, thus confirming the impression which has been gaining ground that the Germans have been cutting their prices severely in competition contracts. In imports of electrical goods the decline continued, the total value being only about 17,000,000 Rm., or less than half the 1930 figure.

The following statement, based on the recently issued official returns, shows the value in thousands of Reichmarks, weight in double centner, and in some instances the number of pieces of electrical material exported from Germany in 1936, together with the values and principal countries of destination of the more important groups of articles. Notes of increases or decreases are added. Outstanding destinations for the dynamo, motor, &c., group were: Up to 5 double centner, Belgium, Holland, the United Kingdom and Turkey; 5 to 30 double centner, France, Soviet Russia and the Irish Free State; over 30 double centner, China and Japan; while the Scandinavian countries, India, Argentina and Brazil figured as good customers for all sizes.

	1936.	Inc. or dec. on 1935.
Lighting and starting apparatus for motor vehicles—		
Value Rm. (1,000)	2,925	+ 365
Number	68,345	+ 3,445
Weight (double centner) ...	7,380	+ 1,490
Dynamos, motors, convertors and transformers, up to 5 double centner—		
Value...	17,964	+ 3,464
Number	1,340,500	+ 126,530
Weight	76,681	+ 21,761
Dynamos, motors, convertors and transformers, from 5 to 30 double centner—		
Value...	5,630	+ 950
Number	3,666	+ 816
Weight	38,850	+ 6,770
Dynamos, motors, convertors and transformers, over 30 double centner—		
Value...	6,960	+ 1,630
Number	617	+ 217
Weight	66,830	+ 26,110
Armatures and commutators—		
Value...	2,880	+ 400
Weight	11,340	+ 3,740
Cable—		
Value...	16,290	+ 4,670
Weight	356,050	+ 101,670
To Holland	2,250	— 160
„ Sweden	1,280	+ 260
„ Argentina	1,650	+ 880
„ Uruguay	480	+ 60
„ Bulgaria	230	— 310
„ Rumania	1,630	+ 1,070
„ S. Africa	1,020	+ 610
Accumulators, plates, etc.—		
Value...	3,170	+ 200
Weight	36,340	+ 2,380
To Holland	990	+ 130
„ Finland	150	+ 70
„ Argentina	240	+ 40
„ Brazil	75	+ 5
„ Sweden	180	— 10
„ Denmark	65	— 5
„ Turkey	75	— 105
„ Greece	250	+ 235
„ India	150	— 10
Electric irons—		
Value...	800	+ 130
Heating and cooking apparatus—		
Value...	6,790	+ 440
Galvanic batteries and parts and heating elements—		
Value...	2,490	+ 460
Weight	21,590	+ 4,250
Measuring and recording instruments—		
Value...	21,230	+ 2,540
Weight	17,270	+ 1,150
To Soviet Union	3,150	+ 2,615
„ Belgium	715	— 85
„ Holland	1,630	— 500
„ France... ...	720	— 230
„ Great Britain ...	1,410	+ 180
„ Sweden	1,680	+ 40
„ Argentina	750	+ 160
„ Spain	640	— 250
„ Italy	1,270	+ 40
„ China	650	— 250
Metal filament lamps—		
Value...	9,040	— 490
Thousands	43,790	— 2,550
To France...	915	— 215
„ Denmark	990	+ 260
„ Norway	280	— 170
„ Italy	650	— 150
„ Switzerland	400	— 90
„ Argentina	280	— 271
Telephone material—		
Value...	14,490	— 280
Weight	10,670	+ 720
To France...	170	— 250
„ Italy	1,760	— 880
„ Holland	2,770	— 480
„ Uruguay	410	+ 270
„ China	1,000	+ 450
„ Bulgaria	660	— 890
„ Greece	1,280	— 40
Wireless material—		
Value...	27,945	+ 1,315
Weight	38,285	+ 1,205
To Belgium	950	— 120
„ France...	2,400	— 370
„ Italy	1,520	— 400
„ Holland	3,450	— 1,080
„ Sweden	2,650	+ 600
„ Switzerland	1,280	— 40
„ Czechoslovakia ...	1,130	+ 170
„ Argentina	470	— 310
„ Norway	1,480	+ 360
Electro-medical and dental apparatus—		
Value	12,630	+ 1,420
Safety and signalling apparatus—		
Value...	5,170	+ 1,540
Weight (double centner) ...	7,900	+ 500
To Great Britain ...	450	+ 120
„ Italy	120	— 80
„ Switzerland	390	— 40
„ Holland	410	— 230
Ignition apparatus, etc., and parts (excl. magnetos) and elec. accessories for motor vehicles—		
Value...	11,070	+ 1,370
Weight	14,690	+ 2,470
To Belgium	420	+ 70
„ France...	1,450	+ 530
„ Italy	720	— 680
„ Sweden	930	+ 140
„ Japan	480	— 160
„ Great Britain ...	1,390	+ 200
„ United States... ...	520	+ 90
Apparatus for lighting, power transmission, electrolysis, resistances, etc.—		
Value...	59,450	+ 7,160
Weight	192,270	+ 25,160
To Belgium	2,850	— 480
„ Denmark	1,450	+ 30
„ France...	3,470	+ 490
„ Italy	3,040	+ 430
„ Holland	5,950	— 210
„ Sweden	7,170	+ 610
„ Argentina	1,750	+ 80
„ Great Britain ...	2,090	+ 490
„ Soviet Russia ...	1,440	+ 1,160
Telegraph or telephone insulators, porcelain—		
Value...	1,710	— 80
Weight	25,020	+ 1,510
Carbon and brushes, microcarbons, etc.—		
Value...	1,745	+ 175
Weight	870	+ 90
Arc lamp carbons—		
Value...	1,570	+ 230
Weight	4,150	+ 380
Electrodes—		
Value...	6,510	+ 1,360
Weight	174,220	+ 64,860
Conduit tubes of paper or cardboard—		
Value...	1,214	— 6
Weight	29,300	— 1,960

New Books

Electrical Engineering. Pp. 299; figs. London: Gresham Publishing Co. Price 21s.

The scope of this handsomely produced volume is not quite so wide as the title might suggest. The range is limited to the more common and useful installation subjects with which it is almost necessary now that everyone shall have some acquaintance. In such a compendium, designed on popular lines, one misses an introduction and there is no name of any editor, technical or otherwise, on the title pages. Here and there throughout the book, there is evidence of lack of co-ordination in the items dealt with by the seven authors concerned. The treatment being, for the most part, elementary, there is no particular informative virtue in the instances of overlapping of subject apparent even in the table of contents included in the volume.

Premier place is given to the wiring of buildings, which is skilfully and comprehensively handled by Mr. H. R. Taunton. In these ten opening chapters he succeeds in giving a good outline of the various accepted systems. His clear manner of describing methods and appliances and his lucid explanations of wiremen's everyday problems enhance the value. In addition to matters of wiring, Mr. Taunton deals in a practical way with lamps, bells, telephones, &c., but has only a page or two left to impart information and advice on the important subject of motors—their principles, application, erection, connection and maintenance.

Mr. L. J. Luffingham is responsible for fourteen excellent chapters on cooking and heating. Showroom attendants might read and learn from this section with profit to themselves and to the industry. The purpose and general design of the various appliances and their components are described and discussed in their mechanical, electrical, thermal, aesthetic and economic aspects.

Shop lighting is the title of an amply illustrated chapter by Mr. J. D. D. Shaw, and Mr. J. M. White deals shortly with lamps, bells, clocks and miscellaneous equipment. Mr. H. H. Harrison has a chapter on the rather specialised subject of automatic telephones. Mr. James Orr contributes a useful section on matters connected with the manufacture and operation of neon signs. He gives practical hints on erection and on how to correct radio interference. Mr. Orr is of the opinion that qualified electrical contractors should take a much greater part in the handling of neon tubes for interior and external schemes.

The book, which in no division is repellently technical, concludes with an article on the electrical equipment of cinemas by Mr. G. F. Jones. In a general way he conveys information of a theoretical and practical nature to the reader desirous of knowledge of the subject. The well-illustrated volume as a whole will appeal to the large public eager for easily understood descriptions of recent development in the domestic, business and entertainment departments of electrical engineering.

Instrument Transformers. By B. HAGUE. Pp. 656; figs. 300. London: Sir Isaac Pitman & Sons, Ltd. Price 35s. net.

The aim of this well-written book by a brilliant investigator has been to express clearly the fundamental principles governing the design of instrument transformers and their testing, and the author has confined his treatment to current and potential transformers used for electrical measurements at supply frequencies; those for protective systems are referred to only in so far as they accord with the general principles. Commercial design methods are not considered, although the author has wisely drawn upon manufacturers for information upon, and illustrations of practical examples of, apparatus now available.

The book is divided into five parts, with the addition of a number of appendices, which include a useful bibliography and list of additional references and authors and subject indexes. The first part deals with the theory and characteristics of instrument transformers of different types and discusses the various national and international standardisation rules for performance. The second part relates to apparatus used in testing instrument transformers for ratio and phase-

angle, while the third and fourth parts are concerned with the actual testing of current and potential transformers for the characteristics mentioned. Part five, entitled additional tests on current and voltage transformers, discusses polarity and terminal markings, temperature rise and dielectric tests.

Nine short appendices follow, of which the outstanding ones are on forces on a straight conductor within a tubular return, tables for phase-angle correction factors, capacitor methods for measuring high voltages, and a note on the theory of neutral-point displacement in single-phase circuits.

Mathematics are restricted to essential explanations or treatments and presuppose a knowledge of the symbolic method of calculation and of the simpler forms of calculus. The illustrations are attractive and well executed, and copious references to, and examples of, foreign practice add to the value of the work. The book can be recommended as of outstanding importance, not only to the designer of instrument transformers and to the meter engineer, but even to electrical engineers and students not directly engaged in this department.

Shorter Notices

"Matthew Boulton," by H. W. Dickinson. Pp. xiv+218. Illustrated. London: Cambridge University Press. Price 10s. 6d. net.—Matthew Boulton is principally known for his association with James Watt, but in this biography Mr. Dickinson shows that he is entitled to be known by himself as a craftsman of considerable ability, and an industrial organiser. The author records the establishment of the Soho Manufactury, Birmingham, the circumstances which brought about Boulton's co-operation with Watt, and the many inventions which were developed as a result of this partnership.

The sixth edition of "Two-Stroke Motor Cycles" (Iliffe & Sons, Ltd., 2s.), contains all the essential information that the motor cyclist requires in order to keep a two-stroke machine in perfect order. The lucid style and excellent sketches make it admirably suited to the novice, while the electrical system dealing with ignition systems and the various forms of lighting are equally clearly explained. Another booklet by the same publishers is "*The Autocar* Guide for the 'L' Driver" (1s.).

"Outdoor High Voltage Switchgear," by R. W. Todd and W. H. Thompson. Pp. 436; figs. 259. London: Sir Isaac Pitman & Sons. Price 42s.

"Diesel Engine Design," by H. F. P. Purday. (Fourth edition.) Pp. 520; figs. 346. London: Constable & Co. Price 24s.

"Connecting Induction Motors," by A. M. Dudley. (Third edition.) Pp. 464; figs. 408. London: McGraw-Hill Publishing Co. Price 21s.

"Practical Handbook of Electro-plating." (Thirteenth edition.) Pp. 359; figs. Birmingham: W. Canning & Co.

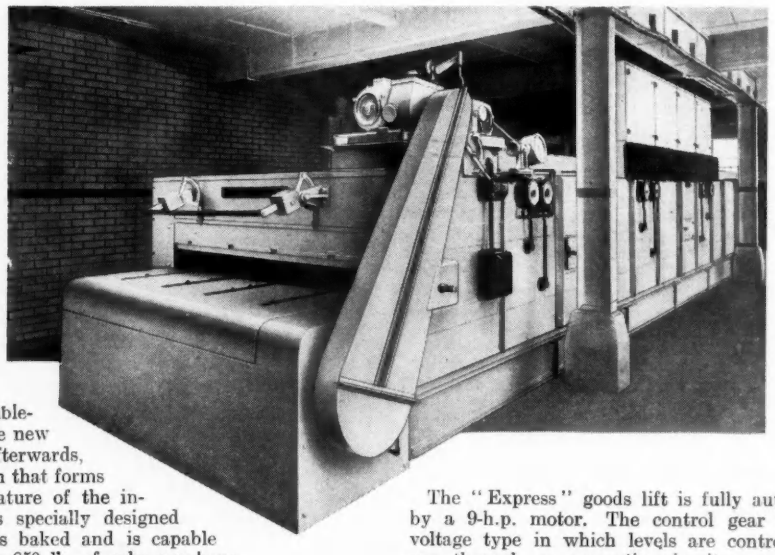
"Positive Rotary Pumps, Compressors and Exhausters," by B. Pugh. Pp. 47; figs. 44. London: Draughtsman Publishing Co. Price 2s. net.

"Commercial A.C. Measurements," by G. W. Stubbings. (Second edition revised.) Pp. 348; figs. 169. London: Chapman & Hall, Ltd. Price 15s. net.

Electric Baking at Oxford

THE latest extension to the premises of Oliver & Gurden, Ltd., whose cakes and confections are distributed in seventeen counties, is typical of the firm's outlook. The new three-storey building has a white glazed-brick interior and solid "granolithic" floors, and is equipped with stainless steel tables and electric baking ovens and mixing machinery, the various floors being connected by conveyors and a 1-ton "Express" goods lift, all electrically driven. The whole of the baking equipment, together with a number of motors for driving mixers and other auxiliary machinery, was supplied by the General Electric Co., Ltd. "Osram" lamps are used throughout the building. The electricity is taken from the 400-V 3-phase mains of the City of Oxford Electricity Supply Department.

The company's first experience of electric baking was obtained with a single-deck G.E.C. oven installed in the existing bakery. After a three months' trial period the results compared with oil-fired ovens were so satisfactory that orders were placed with the G.E.C. for the conversion of the single-deck oven to a double-deck unit, for three similar double-deck Peel units in the new bakery and, shortly afterwards, for the travelling oven that forms the most striking feature of the installation. This was specially designed for the type of goods baked and is capable of baking as much as 850 lb. of cake per hour. Its overall dimensions are 41 ft. long by 8 ft. 6 in. wide, and its internal measurements 35 ft. by 6 ft. 2 in.



The 35-ft. G.E.C. electric travelling oven viewed from the delivery end and showing conveyor drive

Double cased throughout, expansion joints are provided on the inner case at frequent intervals. The whole of the inner case is suspended from a framework to minimise heat losses. The space between the cases is lagged with heat insulating material to a thickness of 12 in. at the top and sides and 10 in. at the bottom. Above and below the conveyor chain are mounted heating elements of the tubular steamtight type. The total loading of the oven is 200 kW, divided into eight separate banks, each balanced across the 400/230 V 3-phase four-wire a.c. supply. In normal operation each bank is automatically controlled according to the temperature. Push-button switches are also provided to allow of any bank being isolated when required; for instance, an element can be replaced if necessary without interfering with the baking.

Arranged above the conveyor is the control gear which consists of mercury-in-steel indicating controllers. The contactors and switchgear are above the oven, and red and green lamps indicate which banks of elements are on circuit. Inspection lights and doors are arranged at three points along the oven length. The doors at each end of the oven are of the rise-and-fall type, with counterbalance weights.

The oven accommodates two 30 in. by 18½ in. trays abreast, these are carried through the oven on a camel-back conveyor chain, which passes through the oven and returns underneath at a speed that can be varied to take from 5 to 120 min. from end to end of the oven. The conveyor is driven by a 2 h.p. 1,455 r.p.m. squirrel-cage induction motor through 24 : 1 reduction gearing and a P.I.V. gear unit.

The three Peel ovens used for cake baking are standard double-deck sack size units, 6 ft. high, 6 ft. 1 in. wide and 9 ft. 8 in. deep overall. The soles are tiled, and the interiors are constructed from sheet steel and finished in vitro-enamel. The loading is 36 kW (18 kW per deck) and the ovens will attain 500 deg. F. from cold in about half-an-hour with all switches in the high position.

The "Express" goods lift is fully automatic and operated by a 9-h.p. motor. The control gear is of the dual low-voltage type in which levels are controlled directly by the car through a magnetic circuit, employing "inductors" fitted on the car. Thus the noise that is inseparable from mechanical contact with tappet switches is eliminated, and the necessity for using chains, ropes, or roller and cam operated devices is avoided; 50 V relays of the standard telephone type are used and the associated floor selector device is embodied in the lift controller itself.

The baking machinery, which was supplied in the main by the Morton Machine Co., includes cake mixers, air pressure whisks, a blender, sifter, and elevator, and an egg defroster. All mixing of cake ingredients, cream fillings, and so on is carried out by two "Gridlap" mixers, each of a capacity of 3 cwt. and driven by a 6 h.p. s.c. motor. For making sponge and Genoese cake a large air pressure whisk, fitted with a steam jacket, is driven by a 4 h.p. s.c. motor. The flour is passed through a blender, sifter and elevator, and the frozen eggs are put into a 75 gal. defroster (with a 2 h.p. motor) from which they are drawn off in a creamy consistent mass. Messrs. Lowe and Oliver, Oxford, were the electrical contractors for the whole installation.

Parliamentary News (BY OUR SPECIAL REPORTER)

Newcastle Trolley Vehicles

THE Newcastle-on-Tyne (Trolley Vehicles) Provisional Order Bill was considered and passed on February 18th by the Select Committee on Unopposed Bills. Capt. R. C. Bourne (Oxford, U.) presided.

Mr. Erskine, of the Ministry of Transport, in explaining the Bill said that more of the tramways in the city were to be converted to trolley-vehicle working. There would be eight new trolley routes, about 6¼ miles in length.

The chairman asked whether tramways would now disappear from the city. Mr. Erskine said some tramways would continue to be used.

Lancashire Electric Power Bill

The same Committee also considered the Lancashire Electric Power Bill on the same day. Mr. Sedgwick, Parliamentary agent, said the company now had an authorised share capital of £4,000,000 and loan capital of £2,000,000 and the respective amounts issued were £3,850,000 and £1,600,973. Power was now sought to raise an additional £1,000,000 of share capital and £500,000 of loan capital. The immediate capital requirements were to repay advances on capital account including the first Kearsley extension existing at January 1st, 1937, £302,016; to complete payments for Kearsley A extension, £79,394; to complete Kearsley B extension, £662,285; together with £500,000 for distribution expenditure for the years 1937-39. There was a clause in the Bill enabling the Electricity Commissioners by Special Order to authorise further increases of capital.

The preamble was found proved and the Bill was ordered to be reported for third reading.

The McGowan Report

In the House of Commons on February 17th Mr. E. Williams asked the Minister of Transport whether he was aware of the apprehension felt by local authorities regarding the recommendations in the McGowan Report; and whether he had any statement to make on the matter.

Mr. Hore-Belisha said that views expressed on behalf of local authorities would receive due attention.

Commissioners and Policy

Mr. Garro Jones asked the Minister of Transport whether he was aware that the Electricity Commissioners were offering guidance and advice to authorised undertakers as regarded future policy in view of prospective legislation anticipated by the Commissioners in accordance with the McGowan Report; whether this action on the part of the Commissioners had his approval; and, if not, whether he would inform them that, in view of the fact that they were a statutory body, they should refrain from such action until the House had had an opportunity of deciding what steps, if any, should be taken in connection with the Report.

Mr. Hore-Belisha said he was not aware that the Electricity Commissioners had in any respect exceeded their statutory powers or duty.

Electrification to Eliminate Cinders

Mr. R. Gibson asked the Minister of Transport if he was aware of the risk of red-hot cinders from locomotives causing damage to persons or property in towns and cities in the case of heavy main-line trains; and whether, to eliminate this risk, he would introduce legislation requiring main railway lines to be electrified at, and for, say, two miles from termini and intermediate stations, and heavy trains with steam locomotives set in motion by separate electric locomotives pushing the trains over the electrified portions, and thereafter the steam locomotive taking up the load without the aforesaid risk.

Mr. Hore-Belisha said that no evidence of appreciable risk was before him.

East London Electrification

Mr. Sorensen asked the Minister whether householders adjacent to the proposed new electric railway track running through Leyton would be paid compensation for disturbance and loss of amenities during and after construction.

Mr. Hore-Belisha said that the London Passenger Transport Board's Act of 1936, which authorised the railway extension to which the hon. member referred, contained provisions of the Land Clauses Acts as modified by the Acquisition of Lands (Assessment of Compensation) Act, 1919. Moreover, the Act provided for the payment of compensation in respect of houses or buildings injuriously affected by the working of the underground railways. The question whether compensation was payable in any particular case was a matter for determination by the Official Arbitrator appointed under the before-mentioned Act of 1919.

Electric Railway Fatalities

On February 22nd Mr. M. Beaumont asked the Minister of Transport how many deaths from electrocution occurred on the lines of electrified railways in 1936 to civilians, to children, and to people employed on the lines, respectively.

Captain Hudson said that two railway employés, eleven children and two other persons, of whom twelve were trespassers, lost their lives in this way. Of the two railway employés one was killed through contact with an overhead conductor.

In the Courts

Damages for Wrongful Dismissal

THE Official Referee, Mr. T. Eastham, K.C., on February 19th, concluded the hearing of an action brought by Mr. Robert C. Salt against the Power Plant Co., Ltd., West Drayton, Middlesex, to recover damages for his alleged wrongful dismissal from the position of secretary of the defendant company.

Mr. Salt became secretary in 1918 at a salary of £400 which increased to £600 a year, but which for economical reasons was afterwards reduced to £450. In 1925 the managing director of the company wrote to Mr. Salt confirming an agreement that his employment should continue for a further three years, at the end of which period the company should have the right of terminating the agreement by giving Mr. Salt notice prior to December 31st, 1928, and in the absence of such notice the engagement should remain in force as a permanent one. Mr. Salt continued for a further nine years, but in June, 1935, the company gave him six months' notice terminating his engagement. In these circumstances Mr. Salt contended that according to the agreement a notice to terminate it had to be given by a certain date and as that date had long passed his engagement could not be terminated.

For the company it was contended that "permanent" merely meant that Mr. Salt's employment was expected to continue, and not that it was to continue to the end of his life and that his engagement could be terminated at the conclusion of three years by six months' notice ending on December 31st in any year.

The action originally came before Mr. Justice Horridge in the King's Bench Division, who upheld the company's contention and gave judgment in its favour. From this result Mr. Salt appealed to the Court of Appeal, consisting of Lords Justices Greer, Slesser and Scott (reported in the ELECTRICAL REVIEW, November 6th, 1936). Mr. Salt's appeal was allowed by the Court.

Lord Justice Greer, in giving judgment, said that upon the facts he was clearly of opinion that the right of the company to give Mr. Salt notice terminating his agreement had long expired, and that the notice given by the company was a bad notice. He thought that Mr. Justice Horridge had put a wrong construction on the letter written by the managing director of the company to Mr. Salt. In the circumstances he (the Lord Justice) was of opinion that Mr. Salt had an engagement for life subject to his performing his duties satisfactorily. He thought that the appeal should be allowed with costs and a new trial ordered unless the parties agreed to a reference to a referee to assess the damages. The other Lords Justices concurred.

Later the Lords Justices were informed that the parties had agreed to the case being referred to an Official Referee for the purpose of the assessment of the damages.

Before the Official Referee, Mr. Blanco White, K.C., for the defendant company, said that the evidence justified the directors when they in June, 1935, gave Mr. Salt the six months' notice terminating his agreement with the company coming to the conclusion that he had, probably through advancing years (Mr. Salt is now 63) become lax in his secretarial duties. The question which the Referee had to decide was whether the directors had acted reasonably in arriving at that opinion. He (counsel) submitted that the evidence showed that they had.

Mr. Schiller, K.C., for Mr. Salt, contended that upon the evidence the directors were not justified in dismissing him, and that in assessing the damages the Referee must take into account Mr. Salt's age and the probability of his being able to get further employment. Subject to accident Mr. Salt would in all probability have been able to perform his duties with the company for another six or seven years.

At the conclusion of the arguments the Referee held upon the evidence that Mr. Salt was entitled to recover as damages £2,560, for which sum he gave judgment with costs.

Fatal Shock from a Handlamp

Smith's Hygience Dairies, Ltd., of Higher Ince, were summoned at Wigan on February 19th for neglecting to have a portable handlamp at their premises efficiently earthed, in consequence of which one of the dairy employés was killed. Smith's in turn summoned Francis P. Dorothy, a refrigerating engineer employed by them, for neglecting to have the lamp earthed. Evidence showed that this particular lamp had been scrapped about twelve months ago, but was subsequently

(*Concluded at foot of next page.*)

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Employment in January

Employment in the engineering industry during January continued good on the whole and was very good in electrical engineering. The *Ministry of Labour Gazette* states that the total out of work in the engineering industry was 66,431, or 6.3 per cent., an increase of 0.3 per cent., as compared with December, and comparing with 10.2 per cent., in January, 1936. In the electrical engineering section the number of unemployed was 3,635 or 3.6 per cent. (5.9 per cent. in January, 1936). The unemployed in the electrical wiring and contracting industry numbered 3,931, the percentage rising from 9.1 to 10.3, as against 14.3 per cent. in January, 1935. In the electric cable, apparatus, lamps, &c., group the unemployed increased from 7,676 to 9,594, or 6.3 per cent., as against 5.1 per cent. in December and 10 per cent. in January, 1936.

New E.C.A. Members

At a recent meeting of the Council of the Electrical Contractors' Association a number of applications for membership were considered, and the following contractors were admitted to full membership :—

W. H. Dixon, 6, Foster Lane, E.C.; A. J. Escott (Escott Bros., Ltd.), 109, Maybank Road, E.18; M. Campbell-Jones (Thorpe & Thorpe, Ltd.), Bush House, Aldwych, W.C.2; V. G. Canham (Bowers & Barr, Ltd.), 24, Regent Street, Gt. Yarmouth; P. J. Dunbar, 9, Hall Quay, Gt. Yarmouth; J. W. Lamb (J. W. Lamb & Sons), 136, Mill Road, Gt. Yarmouth; N. L. Clarke (Norman Clarke, Ltd.), 137, High Street, Berkhamsted; J. J. Cooksey (J. J. Cooksey & Son), 39, Feltham Road, Ashford, Middx; M. G. Cox (Electrical Installations), High Street, Sunningdale; T. H. Lewis (H. Lewis), 107, Chamberlayne Road, N.W.10; W. C. Timpson (Central Electric Co.), Washbrook Road, Rushden; J. E. Trodd, 198, Winchester Road, Southampton; E. Russell, Higher Fore Street, Redruth, Cornwall; D. E. Evans (D. E. Evans & Sons), 54/55, Commercial Street, Ystalyfera; Thomas Jenkins, 10, Gwydr Terrace, Uplands, Swansea; R. F. R. Bew ("Bews"), 52, Market Place, Burslem; L. Wignall (Staffs Electrical Co.), 6, Longport Road, Longport, Stoke-on-Trent; D. Mounsey, 963, Leeds Road, Thornbury, Bradford; Robert Wild, Crown Street, Cockermouth; L. W. J. Lambert (Winstanley & Lambert, Ltd.), 45/47, Edge Lane, Liverpool, 7; Eric Thompson, The Electric Shop, Thirsk, Yorks; M. E. Broadbent (T. W. Broadbent, Ltd.), Victoria Electrical Works, East Parade, Huddersfield; R. N. Tinniswood, 48, Market Street, Westhoughton.

The following contractors were admitted to associate membership :—

J. Bateman, 41, Chinbrook Road, Grove Park, S.E.12; Fred Standley, Market Place, Wymondham; J. F. S. Small, 4, Chapel Street, Guildford; H. D. Tanner (Southern Electrical Services), 151, Victoria Road, Aldershot; C. W. Sargent (Sargent's Electrical Supply Services), 44/6, High Street, Shoeburyness; J. Bridger, 71, Woodfield Street, Morriston, near Bridgend; H. Rylance, 1, Maesteg Road, Llangynwyd, near Bridgend; E. M. Thorns, 5, Church Street, Modbury, S. Devon; F. S. Boucher (F. S. Boucher & Co.), 312, Deansgate, Manchester, 3; D. Tanner (Schofield & Tanner), 673, Manchester Road, Denton.

Brighton's Steam Collier

With the arrival at Southwick, Brighton, of the *Arthur Wright*, Brighton's fleet of colliers is now so far complete. The *Henry Moon*, delivered a short time ago, is now in regular use bringing 1,500 tons of coal each time for use at the Corporation power station at Southwick. It is estimated that a saving of 6d. a ton will result. The accompanying illustration shows the *Arthur Wright* arriving at the power station.

The new steam collier "Arthur Wright" of the Brighton Corporation Electricity Department

Electrical Contractors' Dinners

The annual dinner-dance of the Glasgow Division of the Electrical Contractors Association was held at the Grosvenor, Glasgow, on February 17th. Mr. H. M. Spiers presided, and among those present were Bailie Mrs. J. Roberts, Convener of the Glasgow Corporation Electricity Department, and Mr. H. Bell, general manager of the Department. The chairman suggested that Glasgow should give free electricity for floodlighting purposes during Coronation week. The idea had been adopted in a number of areas, and he had no doubt it would be successful in Glasgow. Mr. Spiers replied to the toast of the Association which was proposed by Mr. Bell.

Mr. J. R. Struthers, general manager of the Sheffield Corporation Electricity Department, speaking at the annual dinner of the Sheffield Branch of the Electrical Contractors' Association, on February 19th, said that in an effort to stop "scamped" electrical work a committee had been formed to draw up a list of approved contractors from which people could select the men to do their work. The contracting side of the Corporation Electricity Department was a side-line only, and they did not wish in any way to compete with the ordinary contractor. The Department's job was to educate the public in the advantages of electricity, and although it was engaged in contracting work it was only too pleased to help the contractors. Mr. H. Clarke, president of the Electrical Wholesalers' Federation, expressed the hope that before long conferences between the Association and the Federation would be possible whereby differences would be cleared away. One evil of which he thought the Association was not fully aware was that very cheap electrical accessories and apparatus were offered for sale in some stores. These were handled by assistants who knew nothing about their usage. The time had come when

In the Courts *(Continued from previous page)*

adapted by Dorothy for his own use at the works. The company did not know of this.

No fine was imposed on the company but Dorothy was fined £5 and ordered to pay £1 17s. 6d. costs.

The Universal Lamp Company

In the Companies' Court on February 22nd Mr. Justice Bennett again had before him the petition for the compulsory winding up of the Universal Lamp Co., Ltd., Great Eastern Street, E.C., the petitioners being Thorn Electrical Industries, Ltd. At previous hearings of the petition adjournments were granted for the purpose of allowing the Lamp Co. to put forward a scheme of arrangement and at the last hearing of the petition on February 8th Counsel for the petitioners stated that at a meeting of the company an offer was made which was wholly unacceptable to the bulk of the creditors and that meeting had been adjourned to enable the company to put forward some more acceptable scheme.

When the petition again came before the Court Mr. Salt for the petitioners said that the adjourned meeting of all the creditors was held on February 12th, when the company made an offer of 5s. 6d. in the £ by instalments. The great majority of creditors in value and number agreed to the proposal and he (Counsel) asked that the petition should again be allowed to stand over so that it could come on with the petition to sanction the scheme by the Court.

Mr. J. B. Lindon, appearing for the Lamp Co., said that steps had been taken to formulate a scheme. Mr. N. Gray said he appeared for creditors who opposed the scheme and desired to press for a winding-up order. He desired to make out a case for an investigation of the company's affairs.

His Lordship said the creditors must have an opportunity of considering the scheme.

Counsel representing creditors of the company for £1,100 stated that they were in favour of the proposed scheme. Counsel for other creditors said they also supported the scheme.

In the result his Lordship said that the petition would stand over to come on with the scheme of arrangement with liberty to restore the hearing of the petition if the scheme was not proceeded with with due diligence.

this matter should be tackled. Alderman W. J. Hunter presided, and other speakers included Mr. H. J. Burdett, Mr. R. A. Chaytor, chairman of the Sheffield Sub-Centre of the I.E.E.; Mr. H. Wheeler, chairman of the Sheffield Branch of the E.C.A.; Mr. A. Longden, chairman of the Sheffield Electricity Committee, and Councillor A. Oates.

The Eastbourne, Bexhill and Hastings Branches of the Electrical Contractors' Association combined, on February 19th, in holding their second annual dinner and dance at the Queen's Hotel, Eastbourne. Mr. H. Beney, chairman of the Eastbourne Branch, presided, supported by the Mayor (Councillor J. Wheeler), Sir Felix Pole, and others. In his reply to the chairman's toast of the "Municipal Corporations and Public Bodies of East Sussex" the Mayor referred to the recent decision with regard to municipal trading at the electrical showrooms, and remarked that he thought the decision against such trading was right. Tribute was paid to the chairman's work on behalf of the Eastbourne Branch, which he was mainly responsible for forming. After the toasts, speeches and some presentations, there was an entertainment and dancing.

The annual dinner of the Maidstone branch of the E.C.A. was held on February 18th at the Royal Star Hotel, Maidstone. In proposing the toast of "The E.C.A. and the Maidstone Branch," Mr. N. V. Everton (E.L.M.A.) said the relationship between the Association and the Maidstone supply authority was good, and this was largely due to Mr. E. E. Hoadley, the borough electrical engineer. Mr. L. C. Penwill (director and secretary of the E.C.A.), in reply, said that the Association was anxious to co-operate with the supply undertakings, and the example of co-operation set by Mr. Hoadley was being followed throughout the country. In replying to the toast of the "Electricity Supply Undertaking," Mr. Hoadley said that the members of the Maidstone branch of the E.C.A. were acting as the Corporations' unpaid canvassers. They had a mutual respect and trust for one another.

Territorial Recruiting

Lord Hirst presided at a meeting of about 600 directors of engineering and industrial firms on February 18th at the headquarters of the London Regiment, when a resolution was adopted pledging those present to interest themselves in securing that 5 per cent. of their male employés shall enlist in the Territorial Army, particularly those with engineering training.

A Refrigerator Convention

The first refrigerator convention and luncheon of the Cooper-Stewart Engineering Co., Ltd., was held on Monday last at Frascati's Restaurant. The meeting was opened by Mr. Wykes, the chairman, who expressed the desire to make the public in this country as "refrigerator-conscious" as it is in America. The sales plans for the year were outlined by Mr. A. Reynolds, sales manager of the Electrical Department. These are to include a national advertising campaign and a stand at the Ideal Home Exhibition, while a considerable amount of money is to be spent on the general development of refrigeration. Mr. Webb described the new de luxe range of refrigerators in detail, showing the special exclusive features—a hinged basket, removable tray, sixteen point cold control, vapour sealed cabinet and slow-running twin-cylinder compressor. The toast of the visitors was given by Mr. R. W. Grace, the secretary, Mr. D. Barrie (Sussex and Kent distributor) responding. They were followed by Mr. Skews (Leeds) and Mr. J. Priestly, of Messrs. Priestly & Ford. After the luncheon the guests inspected the refrigerators.

Lighting of Tir John Power Station

The lighting installation of the Tir John power station, Swansea, has recently been completed. The scheme, which was prepared by Holophane, Ltd., in conjunction with Preece, Cardew & Rider, consulting engineers, is founded on the latest modern lighting practice for central stations. The main turbine room is lighted by means of vertical units close to the ceiling and augmented by a series of refractor plate wall lanterns along each side. The use of Holophane heavy-duty units for power station lighting is made an important factor in the general scheme of lighting, and fittings designed for the various sections of the station have been employed, including special enclosed prismatic pendants for the boiler house basement, and prismatic bulkheads or enclosed pendants in other parts of the power house. Floodlighting has been provided for a portion of the coal dump, for the lime tanks outside the general building, and the approach to the station. The extensive railway tracks and sidings have an adequate standard of yard lighting, Holophane "Duo-Dome" refractor units being employed. The installation work was carried out by the Colston Electrical Co., of Bristol.

A Bournemouth Catering Exhibition

From February 15th to 18th Aish & Co., the Bournemouth electrical contractors, held an exhibition of hotel, restaurant, confectioners and ice-cream electrical equipment at St. Stephen's Hall, Bournemouth. A feature of the event was a chefs' competition which was judged by the local hotel associations.

A catering exhibition at Bournemouth

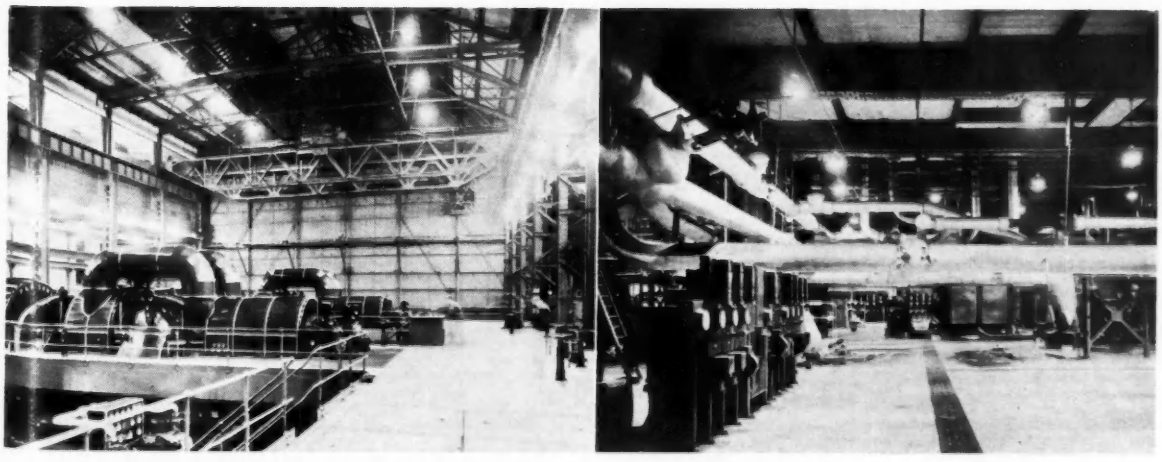
Trade Announcements

The General Electric Co., Ltd., announces that owing to the rapidly growing public interest in television it has opened an information bureau at Magnet House, Kingsway, W.C.2.

The Colton Electrical Equipment Co. has purchased the business of Estler Bros., Ltd. (in liquidation), together with the entire stock, drawings, patterns, tools, jigs, goodwill, &c., covering only the overhead line material for trolley bus and electric runway systems, and several other electrical specialities of that company.

The Horstmann Gear Co., Ltd., has acquired an additional factory, known as Albion Works, Bath, with approximately 15,000 sq. ft. of floor space and accommodation for 500 workpeople. It is hoped that the new premises will enable the company to accelerate deliveries and permit the production of additional "Newbridge" automatic lighting time-switch models.

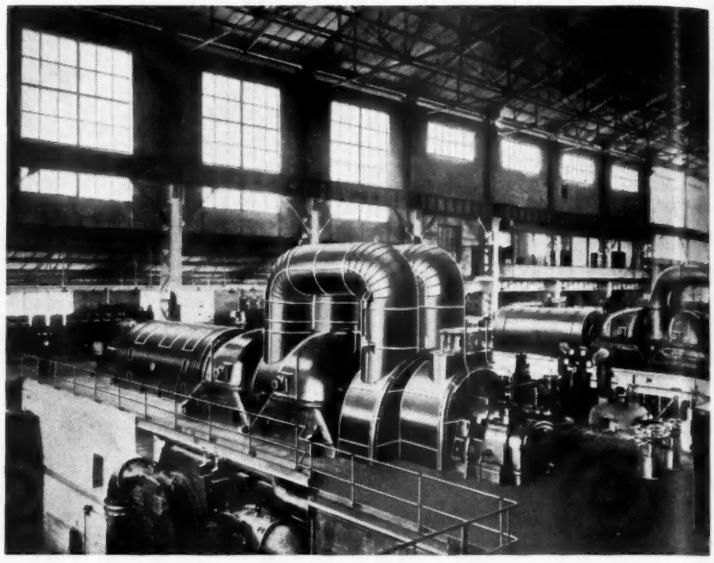
The Wholesale Fittings Co., Ltd., has opened a new branch at 101, Dean Street, Oxford Street, W.1 (telephone: Gerrard 7222).



Holophane lighting units installed at Tir John power station, Swansea, showing (left) the main turbine room, and (right) the feed pump basement

The Klip Power Station

The prosperity of the Rand gold mining area is reflected in the rapid increase in the demand for electrical power from the Victoria Falls and Transvaal Power Co. To meet this demand a new power station has been erected near the Klip River about thirty miles south of Johannesburg. For the station sixteen turbo-alternators with condensing plant have been ordered from the Metropolitan-Vickers Electrical Co., Ltd. They comprise twelve main sets each of 33,000 kW capacity (40,000 kVA, 0.825 p.f., 10,500 V) at 3,090 r.p.m., and four house sets each of 7,000-kW capacity (8,750 kVA, 0.8 p.f., 2,100 V) at 3,090 r.p.m. The aggregate capacity of the sixteen sets will be 424,000 kW, and together with the existing stations at Brakpan, Simmer Pan, Rosherville, Vereeniging and Witbank will bring the total capacity of the turbo-alternators operated by the Victoria Falls and Transvaal Power Co., Ltd., to 820,500 kW. The Klip and Witbank stations are the property of the Electricity Supply Commission of South Africa, and are operated for the Commission by the Victoria Falls Co.



The Klip power station, showing the first three sets

A Topical Window Display

During the fourth test match between England and Australia the Birmingham Electric Supply Department had a window display representing a batsman being bowled. The figures were built up as far as possible with pieces of electrical apparatus, while the spectators in the stand were composed of electric lamps. The score board contained a number of electrical messages.

G.E.C. Plymouth Branch

The premises occupied by the Plymouth branch of the General Electric Co., Ltd., in Union Street have recently been largely rebuilt. As a consequence the building, raised from two to four floors, has provided additional showroom, storeroom and office accommodation that was rendered necessary by expanding business. The display windows, with the system of "Gecoray" lighting incorporated, permit a detailed examination of the exhibited goods. The entrance now gives direct access to a spacious showroom assigned to domestic electrical appliances. To the rear of this showroom is a larger one, almost exclusively allocated to a display of modern lighting fittings. The trade counter on this floor has also been extended, and a large number of steel storage bins have been erected to accommodate various stocks. On the first floor the additional accommodation has provided better showroom facilities for displaying installation material, industrial equipment, radio receivers, &c. The office accommodation on this floor has also been readjusted. The new third and fourth floors have been set apart primarily as stockrooms, and have trebled the capacity of stockroom space at the branch.

A part of the reconstructed showrooms at the G.E.C. Plymouth branch

Catalogues Wanted

Elliott & Madams, electrical engineers, have commenced business at 42, Great Pulteney Street, Piccadilly, W.1, and ask for manufacturers' catalogues and prices.

The Aberdeen "Chief's" Post

Our Aberdeen correspondent informs us that the Town Council is to meet at an early date to consider the thirty-one applications which have been received as a result of the re-advertisement for a chief electrical engineer to succeed Mr. J. A. Bell who retired last July. When the vacancy was first advertised a commencing salary of £900, rising to £1,050 was offered. This was considered inadequate by the A.M.E.E. and E.P.E.A. who advised their members not to apply for the post. They considered that the commencing salary should be £1,200. Nineteen applications were received but the Electricity Committee decided to re-advertise the vacancy omitting any reference to salary. It is suggested that the figure will be discussed with the candidates who are selected from the short list.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. February 24th	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... "	£18 10s.	—
a Borax ... ... "	£17	—
a Copper, Sulphate ... ... "	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¾d.	—
a " Perchlorate ... ... "	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a " Roll ... ... "	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a " Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b " Wire ... ... per lb.	1/1 to 1/9	—
b " Sheet and Foil ... ... "	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£227	£14 inc.
Grade II ... ... "	£160	£9 inc.
Grade III ... ... "	£89	£4 inc.
c Brass (rolled metal 2" to 12" basis) per lb.	10¾d.	1¼d. inc.
c " Tubes (solid drawn) ... ... "	1/1 to 1/1¼	1¼d. inc.
c " Wire, basis ... ... "	10¾d.	1¼d. inc.
c Copper Tubes (solid drawn)... ... "	1/3d.	1¼d. inc.
g " Bars (best selected) ... per ton	£107	£20 inc.
g " Sheet ... ... "		
g " Rod ... ... "		
d " (Electrolytic) Bars ... ... "	£57	—
d " " Wire Rods ... ... "	£64	—
d " " H.C. Wire ... per lb.	9¼d.	—
f Ebonite Rod ¼" dia. & up. ... ... "	1/8 to 2/2¼	—
f " Sheet ⅛" thick & up ... ... "	1/4 to 1/8	—
n German Silver Wire, Nos. 1 to 12 ... "	2/2	—
h Gutta-percha, fine ... ... "	nom.	—
h India-rubber, Para-fine ... ... "	1/-	2d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i " Wire galv. No. 1, P.O. Qual.... "	£20	—
g Lead, English Pig ... ... "	£32 5s.	£3 5s. inc.
g Mercury ... ... per bot.	£14 5s.	—
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e " " " medium ... "	5/- to 10/-	—
e " " " large ... "	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... "	1/2½d.	—
p " " drawn bars & rods "	1/3½d.	1½d. inc.
p " " rolled strip & sheet "	1/2½d.	1½d. inc.
p " " wire ... ... "	1/3½d.	1½d. inc.
o Platinum ... ... per oz.	£11 15s.	£2 5s. dec.
d Silicium Bronze Wire ... ... per lb.	9¾d.	—
g Spelter ... ... per ton	£28 17 6	£5 16 3 inc.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£250 10s.	£22 15s. inc.
n " Wire, Nos. 1 to 16 ... ... per lb.	4/1	—

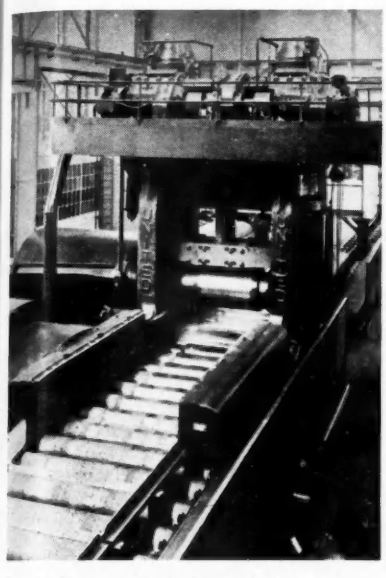
Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes."

A Steel Mill Film

Two films of rolling mills recently constructed in the U.S.A., were shown last week at a film exhibition by British Timken, Ltd. It was stated that these mills are larger than any in this country or in Europe. The first film showed the continuous broad strip mill of the Ford Motor Co., Dearborn, Michigan. This mill is capable of finishing all the sheets required under a production schedule of 3,000 cars per day. The hot strip mill is designed for the production of strip in gauges as light as No. 18 and in widths up to 48 in. The cold mill is designed for gauges from Nos. 15 to 25 and widths up to 78 in. The 44-in. blooming mill is driven by a 7,000-h.p. reversing electric motor and for transporting the strip throughout the mill individually motor-driven rollers are used. Strip leaves the finishing train at a speed of approximately 1,500 ft. per min., advancing over the runout table about 300 ft. to either two hot coilers or the flying shear. Approximately 1,400 Timken tapered roller bearings ranging in weight from nearly 4 tons apiece down to about 1 lb. and totalling about 185 tons, are installed in this plant. The second film showed the Macdonald hot strip mills of the Carnegie-Illinois Steel Corporation, Ohio, designed to produce the heaviest coils per unit width yet attempted. The back-up rolls, work rolls and table rollers are also equipped with Timken roller bearings.



The delivery side of the Ford Co.'s blooming mill showing the motor-driven rollers

Air-conditioning Plant

A note in our last issue (page 295) stated that in the Carrier air-conditioning unit the cleaned air was heated and deprived of excess moisture in summer and cooled and humidified in the winter. This was obviously wrong, the system operating in the reverse manner.

New Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—"Farming with Electricity" is the title of a 28-page booklet just issued.

F. C. Heayberd & Co., Ltd., 10, Finsbury Street, London, E.C.2.—A coloured broadsheet dealing with rectifiers and mains transformers.

Brook Motors, Ltd., Empress Works, Huddersfield.—A copy of "The Brook," dealing with matters relating to Brook motors.

Crompton Parkinson, Ltd., Bush House, Aldwych, London, W.C.2.—An illustrated art booklet dealing with lighting units for industrial, shop window and street use.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 44-page profusely illustrated booklet describing Fraser and Chalmers materials handling plant.

F. W. Thorpe, Ltd., 39, Bolton Road, Small Heath, Birmingham, 10.—An illustrated price list of "Thorlux" industrial lighting equipment.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—A coloured catalogue of Coronation illumination devices.

James Beresford & Son, Ltd., Cato Street Works, Birmingham, 7.—A pamphlet detailing "Beresford-Garvens" patent submersible borehole pump and motor units.

"Monitor" Patent Safety Devices, Ltd., Kings Road, Wallsend-on-Tyne.—Leaflets describing electrically operated pressure alarms.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.—A booklet dealing with power factor correction by means of condensers.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—A list of "alphabet" series "Mazda" light tubes.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlets dealing with generators for plating work, equipment for printing offices, and equipment for driving newspaper presses electrically.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—Details of a new low-priced floodlight.

British Insulated Cables, Ltd., Prescot.—A catalogue of the B.I. industrial wiring system.

Manchester Insulating Co., Ltd., Mayfield Works, Wyre Street, Manchester, 1.—A price list of insulating materials.

Taylor, Tunnicliff (Refractories), Ltd., Albion Works, Longton, Staffs.—A showcard containing specimens of fish spine beads for wire insulation.

Bankruptcy Proceedings

R. W. L. Frankland, 45, Russell Street, Middlesbrough, electrical contractor, &c.—This debtor's public examination was held at the Court House, Wilson Street West, Middlesbrough, recently, when it was reported that debtor had had twenty-three writs and summonses issued against him, the costs amounting to over £48. Early last year, in an endeavour to increase his income, he purchased a fruit business, still continuing his electrical business. Those efforts, however, proved unavailing. Debtor attributed his failure to loss arising from carrying on business, bad debts, and proceedings taken by creditors. The Official Receiver commented that ever since 1933 debtor had been living at the expense of his creditors. His statement of affairs showed a deficiency of £372.

W. E. Watson and **C. A. Childs,** trading as Watson & Childs (a firm), 7, City Road, and 5a, Southgate Street, Winchester, and at Salisbury, Fareham, Wickham, and Andover, wireless and electrical engineers.—The public examination of the above was held recently at the Court House, Castle Square, Southampton. The joint statement of affairs disclosed liabilities of £4,775, with a deficiency of £1,314, while W. E. Watson's separate estate showed a deficiency of £855, and that of Mrs. Childs a deficiency of £1,017. With regard to a loss of £950 which was incurred during 1932 the debtor W. E. Watson said that during that year the manufacturers cut prices at a time when they held a large stock. In 1935 there was a net profit of £982, but in arriving at that figure only £50 was allowed in respect of bad debts. In that year the balance sheet showed book debts totalling £3,534. The examination was adjourned.

F. E. Walton, Island Hotel, Eel Pie Island, Twickenham, Middlesex, electrical engineer.—This debtor filed his own petition and according to the statement of affairs he has returned there are gross liabilities of £1,590, of which £1,336 is expected to rank for dividend, with assets of £61, leaving a deficiency of £1,275. The debtor attributes his failure to losses on investments in various limited companies, loss on a house at Albourne, Sussex, and becoming liable under guarantee given on behalf of a limited company.

C. E. Pittman, 12, Station Road, West Croydon, electrical contractor and wireless dealer.—Discharge granted subject to nine months' suspension.

J. Jones (J. Jones & Son), radio dealer, 8, Northgate Street, Aberystwyth.—Trustee, Mr. H. W. Thomas, 4, Queen Street, Carmarthen, Official Receiver, released February 10th.

W. Hodge, electrical engineer, 3, Saltash Street, Plymouth.—Supplemental dividend of 1¾d. in the £, payable March 2nd at the offices of Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.2.

J. J. Jennison, electrical contractor, Y.M.C.A., Dale End, Birmingham.—First meeting February 26th at the Official Receiver's office, Exeter Bank Chambers, Broadgate, Exeter. Public examination April 8th at the County Court Offices, Old Town Hall, Torquay.

J. Eisner, J. Sunshine, B. Rome and **T. Otaki** (Lloyd Electric Lamp Co.), 8, Rangoon Street, E.C.3.—Trustee, Mr. G. R. Lowe, River Plate House, Finsbury Circus, E.C.2, released February 5th.

L. Smethurst, electrical and radio engineer, 155, Footscray Road, Eltham, S.E.9.—First meeting March 2nd at 29, Russell Square, W.C. Public examination June 29th at the Court House, Burney Street, Greenwich.

Company Liquidations

Electro Chemical Processes, Ltd.—Under the compulsory liquidation of this company, which carried on business at North Acton, N.W., the statement of affairs shows total liabilities of £7,544, of which £409 is expected to rank for dividend, against assets of £7,979, or a surplus of £7,570 over and above the liabilities, issued capital £561,567, and a deficiency of £553,997 with regard to contributories. Mr. Geo. W. Hutcheson, Assistant Official Receiver, reports that the company was incorporated as a public company on December 15th, 1928, under the title of Einstein's Electro Chemical Process, Ltd., and was formed to acquire from Mr. W. I. Einstein processes for the metallising of materials by electro-chemical action. The company was promoted by Mr. Arthur Ladenburg and the Sanctuary Trust, Ltd., the present title being adopted in 1932. The company acquired from Einstein the benefit of secret processes, &c., for £210,000, payable as to £40,000 in cash and the balance in ordinary shares. Einstein states that he paid £20,000 of the purchase money to the promoters, a fact which was not disclosed to the board at the time. Preliminary expenses amounted to £42,255. The failure of the company was attributed by its officers to the fact that the processes acquired from Einstein were in some cases technically unsound and in others commercially valueless; to the severe competition in the ordinary plating trade into which the company entered; and to lapse of time and heavy expenditure incurred before it was in a position to market satisfactorily colloidal products which depleted its resources and left no funds available to build up the necessary selling organisation. In the opinion of the Official Receiver the failure was due to excessive prices paid for the principal processes purchased which were not at the date of purchase ready for commercial exploitation, thus entailing heavy development expenditure, and to the fact that there was no one on the board having any technical knowledge of the company's activities with the result that there was no effective control of the expenditure. The Court has appointed Mr. A. E. Dunnill, C.A., as liquidator with a committee of inspection. All communications relating to the progress of the liquidation should be addressed to Mr. Dunnill at 109, Kingsway, W.C.2.

Supremus Specialities, Ltd.—Winding up voluntarily. Liquidator, Mr. R. Roper, 46c, High Street, Erdington, Birmingham.

Electric Agencies, Ltd.—Winding up voluntarily. Liquidator, Mr. S. T. Pengelly, 65, Oakfield Street, Cardiff.

Hastings & District Electric Tramways Co., Ltd.—Meeting March 17th at 1, Queen Victoria Street, E.C.4, to receive an account of the winding-up by the liquidator, Mr. H. Pryor.

Electricity Supply

Lighting, Domestic, Power

Aberayron and Lampeter.—RURAL SUPPLIES.—The Rural District Council has consented to the West Cambrian Power Co. erecting overhead lines to afford a supply of electricity to various parts of the rural area.

Aberdeen.—DEVELOPMENT SCHEME.—Details of a scheme for the improvement of distribution costing £132,482 were given to the Electricity Committee last week. This involves an expenditure of £75,941 on eighteen 6,600-V feeder cables, the provision of eighteen transformer kiosks with five 500-kVA transformers, and mains and services in numerous areas. Mr. Hodson, the acting electrical engineer, points out that because of the mild weather the maximum demand for electricity in December did not reach the figure anticipated, but was, however, 2,660 kW higher than in the corresponding month of the previous year. The load on a number of outlying d.c. mains was becoming such as to cause a serious drop in pressure, and the permanent cure was to change over consumers to an a.c. supply.

Aberystwyth.—ELECTRICITY REPLACES GAS.—Fourteen new electric lamp standards are to be erected at South Marine Terrace and eight at Trefechan Bridge to replace the present gas lighting.

Aylesbury.—EXTENSIONS.—The Electricity Committee is to carry out cable extensions in Walton Road (£130), and in Chiltern Street (£135).

Bedford.—MAINS AND SERVICES.—Sanction has been obtained to a loan of £5,000 for mains and services.

Bexhill.—LOAN.—The Electricity Committee has obtained sanction to borrow £6,000 for mains and services.

Bexley.—SUB-STATION.—To cope with the increased demand for electricity in the Sidcup area, the Council is to erect a sub-station in Old Farm Avenue at a cost, including the necessary alterations to switchgear at the main sub-station, of £16,000.

Brighton.—PLANT EXTENSIONS.—As the Central Electricity Board is pressing for the placing of contracts for 33-kV switchgear to be in commission next autumn, the Electricity Committee is applying for sanction to borrow £241,100 for the extension of the plant and other work at the Southwick power station.

SUB-STATIONS.—A sub-station is to be erected in Islington Road in preparation for the change-over from d.c. to a.c., at a cost of £2,797. The Committee has also decided to apply for approval of an expenditure of £3,542 for the erection of a sub-station in Hill Drive, Hove, to provide a supply to the Tongdean estate now in the course of development.

Chester.—BETTER LIGHTING.—The electric street lighting in Queensway is to be improved at a cost of £376, and the Markets Committee has decided to install a system of lighting by Wardle lanterns at the public markets at a cost of £266.

SUB-STATION.—The Electricity Committee is to obtain a sub-station site in Grosvenor Park.

HOSPITAL EMERGENCY LIGHTING.—Emergency lighting is to be installed at the hospital at a cost of £236.

Clacton-on-Sea.—TWO-PART TARIFF.—A business two-part tariff has been approved. It consists of a fixed charge of £8 10s. per kW of lighting installed, payable in four equal quarterly payments, plus 1d. per kWh for electricity used.

Croydon.—UTILISING DESTRUCTOR STEAM.—The Electricity Committee has approved a scheme for the utilisation of steam from the proposed new destructor at Factory Lane, at a cost of £35,000.

EXTENSIONS.—Mains extensions are to be carried out by the Electricity Committee at a cost of £909 to supply a new estate off Downsview Road, and at a cost of £504 to supply a new cinema at Station Road, South Norwood.

Fort William.—CALEDONIAN POWER BILL.—The Council has under consideration a draft agreement with the British Oxygen Co. for a supply of electricity in bulk to the town in the event of the Caledonian Power Bill being passed by Parliament.

France.—PRODUCTION OF ELECTRICITY IN 1936.—The Ministry of Public Works states that the production of electricity during 1936 by large undertakings (about 95 per cent. of the total production) was as follows: Thermal stations, 3,704 million kWh, against 3,877 million kWh during 1935; hydro-electric stations, 7,681 million kWh, against 7,199 million kWh; total, 11,385 million kWh against 11,076 million kWh the year before. This result is considered particularly good as during a part of the year strikes reduced the consumption of many of the large industrial users.

Glasgow.—MAINS.—Distributing mains are to be laid at a cost of £13,430.

FLOODLIGHTING.—Permanent floodlighting of the municipal buildings is being considered by the Electricity Committee.

CO-ORDINATION CONSIDERED.—Five members of the Electricity Committee have been appointed to confer with an equal representation from the Gas Committee on the co-ordination of those sections of the two departments whose functions are similar.

Isle of Thanet.—CHEAPER ELECTRICITY.—The Isle of Thanet Electric Supply Co., Ltd., announces a reduction in its lighting flat rate at Margate, Westgate, Birchington, Broadstairs and St. Peter's to a maximum of 6d. per kWh.

Italy.—NEW HYDRO-ELECTRIC STATION.—Plans for the construction of a hydro-electric station for the utilisation of the power of the Isonzo River have been completed and work is expected to begin shortly. The project calls for the erection of a dam 165 ft. high which will create a lake of 21,780 million gallons. From this water will be taken by a gallery 2½ miles long to Doblari, at which point the station will be built. Here there will be three turbo-generator groups of 50,000 h.p. each. The energy produced at 8,000 V will be stepped up to 130,000 V for connection to the high-voltage network.

Kendal.—PROTEST AGAINST OVERHEAD LINES.—The Ministry of Transport has upheld the Council's objection to the proposed erection of overhead lines over Scout Scar, in connection with the carrying of power from Kendal to Staveley. The Central Electricity Board has been instructed to place the cables underground.

Kettering.—CONSUMERS AND APPARATUS.—It is stated that the Electricity Department now supplies 9,500 consumers in Kettering and an additional 9,900 in the surrounding district. Domestic apparatus hired to consumers includes 2,800 cookers, 1,225 wash boilers, 445 water heaters, 3,571 kettles, and 860 boiling plates.

India.—AIRWAY BEACON.—Further progress is reported by Imperial Airways in the equipment of the Karachi-Calcutta sections of the main Empire airway for regular night-flying. An automatic beacon of the latest type has just been installed at Daro-Naro, in the Thar-Parker district. The switching on and off of the light is controlled by photo-electric mechanism. To guard against any accidental failure of the apparatus two complete sets of operating mechanism are provided, the switchgear being arranged so that if one fails the other comes into commission automatically.

Lichfield.—RURAL EXTENSIONS.—Consent has been received from the Minister of Transport to the erection of overhead lines for the purpose of affording a supply of electricity to Woodshoot Farm, King's Bromley, and Lupin Farm, Orgreave.

Liverpool.—SUPPLY TO RAILWAY.—The Electric Power and Lighting Committee is to negotiate with the L.M.S. Railway Co. for supplying electricity, estimated to amount to about 40,000,000 kWh per annum, to the Southport and Ormskirk lines. Power is at present obtained from the company's generating station at Formby.

London.—HACKNEY.—In connection with the Council's scheme for the improvement of street lighting in the borough the Works Committee reports that at January 15th last 950 new standards had been erected in side streets. In addition, on January 25th new main road lighting in Stamford Hill was put into operation.

It is proposed to seek sanction to a loan of £2,320 for a transformer centre in the Theydon Road area. This will cater for further large extensions at the Leaside Wharf of James Latham, Ltd., and also for other factory loads in the surrounding district.

ISLINGTON.—The Electricity Committee reports that owing to the great increase in the number of installations under the rental wiring scheme it is necessary to make further provision for the remainder of the period to March 31st, 1938, at a cost of £25,000.

ST. PANCRAS.—The Electricity Committee is to extend mains at a cost of £2,266.

Arrangements have been made for floodlighting equipment to be installed at the new town hall, which is to be officially opened by the Mayor (Alderman R. F. W. Fincham) on July 1st. The cost of the equipment will be £1,427.

FULHAM.—The Electricity Commissioners have sanctioned loans for the following purposes: Buildings and civil engineering works, £17,518; plant and connecting cables, £85,892; domestic electrical apparatus, £40,000; additional boiler feed pump, £1,800.

A letter has been received by the Electricity and Lighting Committee offering the congratulations of the Fulham Chamber of Commerce on the great strides made with regard to street lighting, adding that there is no doubt that the new lamps are a great improvement. Recently new main road lighting by 452 mercury electric-discharge lamps was inaugurated.

The s.s. *Fulham III* will be ready for launching to-morrow (Saturday). It is to be christened by the deputy Mayor, Miss Gilliatt.

HAMMERSMITH.—It is proposed to substitute an electrical heating installation in place of the existing hot-water boiler at the electricity showrooms.

L.C.C.—In connection with the Coronation celebrations, it is proposed to floodlight the crescent portion of the river frontage and the tower of the County Hall; if desired, the installation can be made permanent. Greenwich Pier will be illuminated by festoons of coloured lights, and the fire floats moored to the jetty at the new fire brigade headquarters on the Albert Embankment will pump jets of water that will be illuminated. The central feature at the top of the building will be permanently floodlighted.

STEPNEY.—Last month a public inquiry was held into the Council's application for sanction to borrow £20,659 for the purposes of its electricity undertaking. The Electricity Commissioners have now intimated their decision to grant permission for the Council to borrow £17,723. In reporting on the result of the inquiry the Finance and Parliamentary Com-

mittee states that it is satisfactory from the Council's point of view.

The report of the Stepney electrical engineer and manager for 1935-36 discloses the fact that the number of applications for new supplies and reconnections was 5,285; for extensions to existing installations 1,550; and 3,049 for transfers. The number of kWh sold to consumers in the borough increased by more than 6¼ million—the largest increase recorded in the history of the undertaking. The total number of consumers under the domestic hire scheme at March 31st last was 2,436, and the total number under the assisted wiring scheme 12,545, representing approximately 88,418 points and a value (including apparatus) of £131,516.

Last year the Council received the formal consent of the Electricity Commissioners to the distribution system in the whole of its area being changed over from d.c. to a.c. The Council is now recommended to approve an estimate of £100,000 in connection with the carrying out of this work.

BOND STREET DECORATIONS.—In his article in our Coronation illumination number of January 18th, Mr. H. T. Young, President of the I.E.E., made special reference to the efforts which were being made by Bond Street shopkeepers to brighten their thoroughfare during the period of the Coronation celebrations. The prizewinning design was illustrated. On Wednesday last week a "trial run" was made of a section of the scheme. Four decorated banners 30 ft. long and 5 ft. wide were suspended at 30 ft. intervals and at nightfall they were illuminated by specially designed G.E.C. fittings installed by the District Electric, Ltd., of Finchley. The accompanying illustration gives some idea of the effect obtained.

[*Elec. Rev.* photo

An experimental section of the Bond Street decorations

BATTERSEA.—In order to deal with the increasing load in the southern area it is necessary to lay an e.h.v. feeder from the Peabody estate sub-station to Chatham House sub-station, and to provide switchgear for the feeder in these two buildings. It is also necessary to erect an additional sub-station with transformers and switchgear in this area. The estimated cost of the work is £10,813. In view of the increasing load in the St. John's Hill area, and in order to relieve the d.c. system, it is advisable to change over the supply from d.c. to a.c. The estimated cost of changing consumers' apparatus (approximately 1,000 consumers), laying the necessary additional mains and replacing existing mains is £4,596.

ST. MARYLEBONE.—In connection with the South East England Electricity Scheme the Central Electricity Board proposes to install a transformer group of 30,000 kVA for connection with the new Fulham generating station on a site near the St. Marylebone Council's generating station.

Lowestoft.—NEW CABLES.—Work is to be commenced on the laying of high- and low-voltage cables at an estimated cost of £1,050 to provide a supply of electricity to Rist's works at Waveney and Oulton Broad. Negotiations are proceeding with regard to the Council laying a low-voltage main from a kiosk at Pakefield to a sub-station on a new estate at a cost of approximately £1,200. The Council has asked for a guarantee of 15 per cent. of the approximate outlay for five years, subject to a rebate from any profit arising from the extension.

CHANGE-OVER.—Application is being made to the Electricity Commissioners for a loan of £13,500 to cover the cost of converting the supply in further portions of the borough from d.c. to a.c.

Macclesfield.—AN ALL-IN SHOP TARIFF.—The Electricity Company of Macclesfield, Ltd., has offered as an alternative to the flat rate tariff of 5d. per kWh an all-in shop tariff comprising a fixed annual charge payable by equal monthly instalments, based on the floor area and window frontage of the premises. For every £1 of this annual charge 60 kWh will be supplied free each year, any additional amount being charged at 1d. per kWh. Supplies will be given under this tariff on a yearly contract only. The company offers a further concession for exterior floodlighting, reducing the rate from 3d. to 1½d. per kWh.

Poole.—LIGHTING CONTROVERSY.—At its last meeting the Council by a narrow majority decided to light certain of the main roads and streets by electricity. An appeal was made to the Sheriff to call a town's meeting on the matter, but this he deemed inadvisable. He has, however, asked the Ministry of Health to withhold loan sanction until the next Council meeting on March 2nd, when it is stated that a rescinding motion will be tabled.

Portland.—WATER HEATERS ON HIRE.—The hire charge for 1½-gal. water-heaters has been reduced to 2s. 6d. per quarter, the Electricity Department having found that maintenance costs are lower than was at first anticipated.

Russia.—A 100,000-kW SET.—It is reported in a recent issue of *Za Industrializatsiu* that the Stalin Metallurgical Works in Leningrad is making a 100,000-kW turbo-generator. It is expected to be ready in July next.

POWER IN ARMENIA.—Discussing the development of Soviet Armenia, the *Monthly Review* of the U.S.S.R. Trade Delegation in Great Britain states that the capacity of the power stations did not exceed 3,100 kW before the War, and later declined to 1,500 kW. Now it amounts to 48,500 kW, and by the end of this year the first section of the Kanakir station will be in operation; when all its sections are complete the station will have a capacity of 113,000 kW. Electricity for power as well as lighting is being introduced on the collective farms, and preparations are in hand for meeting the Republic's developing need for electricity. This year work will commence on a new station at Gyumush, which is to be the largest yet constructed in Transcaucasia and will have a total capacity of 260,000 kW.

Sittingbourne and Milton.—STREET LIGHTING.—The Urban District Council has accepted the offer of the Kent Electric Power Co. for public lighting at Gaze Hill Avenue.

Southend-on-Sea.—MEETING INCREASED DEMANDS ON THE GRID.—In a recent report to the Electricity Committee Mr. A. C. Johnson, the borough electrical engineer, outlined the rapid growth of the undertaking and the need for further transformer plant and switchgear to meet additional demands on the grid. He said that electrical energy sold by the undertaking in 1936 was twice as much as three years ago and greatly exceeded expectations. It was now necessary to consider increased bulk supplies and their distribution. He had investigated four schemes and recommended the adoption of one which provided for increased 11-kV bulk supplies at London Road and the laying of 11-kV trunk feeders to boost the pressure of the supply at Leigh and Thorpe Bay. Under this scheme the Central Electricity Board would lay additional lines from Rayleigh to London Road and would purchase a site in the Nazareth grounds for the erection of additional transformer plant. The C.E.B. had agreed to sell part of the site to the Corporation for accommodating a portion of the undertaking's new extra-high-voltage switchgear. The Committee was of opinion that the scheme suggested by the engineer should be approved and that application should be made for sanction to a loan of £53,100 to cover the cost.

Stirling.—SUB-STATION.—A sub-station is to be erected in the Drip Road district at an estimated cost of £1,750.

Sunderland.—MAINS.—The Town Council is to extend the medium voltage mains from the sub-station in Pann Lane to Union Street at a cost of £262.

ELECTRIC-DISCHARGE LIGHTING.—With a view to experimenting in the better lighting of the town the Town Council has decided to spend £275 on the provision of sodium electric-discharge lighting in Gladstone Street, Sunderland.

Swale (Kent).—OVERHEAD LINES.—The Rural District Council is to raise no objection to the proposal of the Kent Electric Power Co. to erect specified 11,000-V overhead lines in the

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1934/35.	1935/36.	1934/35.	1935/36.	1934/35.	1935/36.	1934/35.	1935/36.	
		£	£	£	£	£	£			
Bacup	W. H. Metcalfe	29,296	31,774	21,336	23,865	3,334	3,120	5,739	6,352	10.6
Battersea	H. F. J. Thompson ...	219,035	247,469	149,596	169,792	26,419	34,810	40,207	47,143	17.2
Epsom and Ewell	H. W. Watts	51,401	60,297	33,029	39,412	1,663	1,493	6,281	7,698	22.5
Great Yarmouth	P. E. Rycroft	152,728	168,349	86,907	88,274	9,391	29,451	24,082	29,199	21.2
Horsham	F. Ffrench	29,546	34,397	18,031	19,240	1,445	3,296	2,741	3,644	32.9
Mexborough	E. Andrews	24,473	28,577	16,312	19,551	676	2,264	2,671	3,388	26.8
Morecambe and Heysham	P. Clegg	66,628	74,009	31,214	36,672	9,224	9,663	8,139	10,319	26.7
Southend-on-Sea	A. C. Johnson	281,351	326,888	172,566	188,346	70,251	72,268	39,380	49,553	25.8
Warrington...	F. V. L. Mathias ...	197,047	214,759	135,912	153,085	11,520	14,994	43,013	47,632	10.7
Weymouth and Melcombe Regis	G. Nicolson	53,813	63,902	30,766	35,512	5,054	10,832	7,036	9,531	35.4

area. An overhead low voltage line is to be erected from Blamblefield Lane, Bredgar, along Swanton Street, to "Downsells," Bredgar.

Todmorden.—ELECTRIC-DISCHARGE LAMPS.—Lighting by sodium lamps is to be provided by the Lighting Committee at a cost of £900.

Tynemouth.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to borrow £10,000 for mains and services and £3,000 for sub-stations.

West Hartlepool.—NEW SUB-STATION PLANT.—The 6,000-V switchboard at the Burn Road sub-station is to be extended and two new transformer switches installed. It is also proposed to install two 300-kVA transformers at the Chatham Road sub-station.

Weymouth.—SUPPLY TO AERODROME.—Arrangements are to be made for supplying electricity to Woodford aerodrome.

MAINS AND PLANT.—The Electricity Committee has obtained sanction to borrow £3,108 for mains and £1,678 for plant.

Yarmouth.—LOAN.—The Town Council has received sanction to a loan of £35,000 for expenditure on mains, services and electrical apparatus.

Traction

Belgium.—PROPOSED ELECTRIC TRAMWAY.—A scheme is under consideration for the construction of a new electric tramway between Bruges and Blankenberghe. The line is estimated to cost nearly £70,000, of which half will be borne by the Société Nationale des Chemins de Fer Vicinaux, 25 per cent. by the Provincial Government authorities, and 12½ per cent. each by the municipal authorities of the two towns concerned.

Brighton.—TROLLEY-BUS SCHEME REJECTED.—At a special meeting of the Corporation a proposal to take immediate steps to promote a Bill in Parliament for the purpose of obtaining powers to substitute trolley-buses for trams on the routes already served by the present tramway system was rejected.

Glasgow.—BETTER "UNDERGROUND" FACILITIES.—To cope with increased traffic on the underground railway during the period of the Empire Exhibition in 1938 six motor coaches and four trailer coaches which were in service under cable haulage conditions are to be reconditioned at an estimated cost of £17,500.

Great Western Railway.—ELECTRICITY CONSUMPTION.—The Great Western Railway Co., in its accounts for 1936, reports that 16,500,000 kWh of electrical energy, costing £60,788, was consumed as follows:—Traction, 7,101,000 kWh; power, 1,373,000 kWh; lighting, 3,462,000 kWh; and to other consumers, 4,069,000 kWh. Generation costs totalled £35,441, distribution £5,577, and superintendence £3,754.

Liverpool.—TRANSPORT FINANCES.—According to the annual estimates of the Liverpool Passenger Transport Department, states the *Liverpool Echo*, there will be a surplus, before charging for renewals and alterations, of £92,000 for the year ending March 31st next, but nearly all that sum will need to be transferred to reserve, renewal and depreciation, leaving a net surplus of about £1,000 instead of the deficit of £46,000 foreshadowed recently by the city treasurer. Permanent-way expenditure of £153,000 is contemplated for the next financial year against £89,000 in the current year. With the object of averting a deficit next year the Committee is recommending a revision of the tramway fares and stages.

London.—BAKERLOO "TUBE" EXTENSION.—Plans for the extension of the Bakerloo Railway in South London are receiving very close attention, it is officially stated. The London Passenger Transport Board has been urged for some time to extend the "tube" from the Elephant and Castle Station to Camberwell Green, and a delegation from South London met Lord Ashfield last October to press for the work to be proceeded with. In a letter this week to the representatives at that interview the Board states that plans for the development of a tube railway in South London are now receiving very close attention by members of the standing joint committee, which is composed of representatives of the main line railways and the Board. Owing to the magnitude of the scheme its consideration must of necessity take some time, and it is unlikely that any effective decision on the proposals will be reached by this committee before March at the earliest. It was proposed as long ago as 1931 that the Bakerloo Tube should be extended from the Elephant and Castle to Camberwell Green. The cost was estimated at £1,875,000, and it was expected that work would be provided for 4,000 men for at least two years.

Rotherham.—SINGLE-DECK TROLLEY-BUSES.—Hitherto most of the trolley-buses in this country have been of the double-deck type. The Rotherham Corporation, which operates a fleet of thirty-five Guy trolley-buses, has, however, lately put in service six single-deck vehicles of the same make each with seating accommodation for thirty-nine passengers. The motor is mounted at the front of the chassis and develops 100 b.h.p. The driver's cab is half partitioned off, a seat to hold two passengers being fitted in the near-side half of the cab. A special feature is that the circuit-breakers are mounted in two steel cases on the off side of the frame, and are operated by two levers on the left of the driver.

Russia.—THE MOSCOW "METRO" IN 1936.—Operating efficiency was the outstanding feature of the Moscow "Metro" in 1936, states the *Monthly Review* of the U.S.S.R. Trade Delegation in Great Britain. The year's working maintained the reputation of the underground railway as one of the safest in the world, 110,500,000 passengers being carried without a single accident. Efficiency in regard to passenger traffic was demonstrated by the fact that the number of passengers handled daily was between 360,000 and 400,000 as against 250,000 to 260,000 in 1935. It is expected that the extension of the service to the Kiev railway station this month will further increase the volume of passenger traffic by 40,000 daily. Operating costs during the year were cut to 18.2 kopeks per passenger, an improvement of 34 per cent. on the 1935 figure, and the railway showed a profit of 12 million roubles at the end of the year, although the original plan estimated only 2.5 million profit. The second "Metro" line in the capital will be opened during the current year.

Communications

China.—LONG-DISTANCE TELEPHONY.—The Hankow-Loyang-Kaifeng long-distance telephone service was recently opened to the public as part of the new nine-province telephone communication system.

Czechoslovakia.—HIGH-POWER BROADCASTING STATION.—The Czechoslovak Telegraph Administration has placed a contract with Marconi's Wireless Telegraph Co., Ltd., for the supply of a high-power broadcasting station to be installed near Brno, where for many years a 32-kW Marconi transmitter has been in operation. The new transmitter will operate with an unmodulated carrier power of 100 kW, but the design of the station is such that the unmodulated carrier power can be increased to 200 kW without undue complications. A crystal drive has a stability of five in one million, and the distortion factor is kept to a low value, and at 90 per cent. modulation does not exceed 4 per cent. The frequency response amounts to ± 2 decibels over a band of 35-10,000 cycles. The design of the transmitter is one which has been largely adopted by the principal broadcasting authorities.

Great Britain.—BROADCASTING AND TELEVISION.—In the House of Commons on February 22nd Mr. Day asked the Postmaster-General whether he would state when it is proposed to open the new broadcasting station at Stagshaw, Newcastle-on-Tyne, and whether he had received any information as to when the new broadcasting stations at South Devon and in the neighbourhood of the Bristol Channel would be commenced. Sir W. Womersley, Assistant Postmaster-General, said he was informed by the British Broadcasting Corporation that the new broadcasting station at Stagshaw would be opened during the autumn. Negotiations for the purchase of a site in South Devon were approaching completion. Tests of several possible sites for the proposed relay station in the neighbourhood of the Bristol Channel were proceeding. Mr. R. Duckworth asked whether recent television experiments had revealed a wider radius of reception, and how the maximum radius now found possible compared with similar experiments in other countries. Sir W. Womersley said that he was informed by the British Broadcasting Corporation that the maximum range of the London Television Station varied with direction, but experience so far suggested that the average range for good reception was of the order mentioned in the Television Committee's Report, namely, about 25 miles. Owing to differences in conditions it was difficult to make precise comparisons, but in general the results in other countries were understood to be somewhat similar to those obtained here.

ULTRA-SHORT-WAVE BROADCASTS.—A plan to utilise the ultra-short waveband for relaying the National and Regional programmes is being considered, states the *Morning Post*, which adds that the idea has arisen from the successful sound transmissions from the Alexandra Palace Television Station. Such experimental relays would be on a wavelength of 7 metres.

Straits Settlements.—TELEPHONE SERVICE WITH LONDON.—A *Reuter* report from Singapore states that a radio-telephone service between Malaya and London will be inaugurated in the near future, and experimental tests on an extensive scale are now being conducted. No decision has yet been made as to the charge for calls.

Alloy Slip-rings

In an effort to minimise the abrasive effect of brushes on the slip-rings of electrical machines, Crompton Parkinson, Ltd., have, since 1926, kept under strict observation several hundred machines fitted with slip-rings made of a low-nickel (nickel-copper) alloy. This material appears to combine suitable electrical properties with a facility in casting greater than that of copper, in addition to a high resistance to abrasion and a correspondingly slow rate of wear. Instances have been quoted in which the actual amount of radial wear on slip-rings, during seven years of continuous running, did not exceed from $\frac{1}{16}$ to $\frac{3}{32}$ in. The detailed requirements of alloys for slip-rings are set out in the February issue of the *Nickel Bulletin*.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Bath.—March 1st. City Council. Transformers and h.v. switchgear. (February 12th.) Street lighting equipments. (February 19th.)

Bexhill.—March 3rd. Electricity Department. Electrical materials for twelve months. (February 19th.)

Blackpool.—March 11th. Borough Council. 6,600-V switchboards and control gear. (See this issue.)

Brighton.—March 8th. Borough Council. Twelve months' supply of electric lamps for street lighting and cables. (February 19th.)

March 4th. Trolley wire and electric lamps. Office of the Tramways Engineer, Lewes Road.

Bristol.—March 15th. City Council. Diagnostic X-ray plant, superficial therapy plant, and light department at the Central Clinic. (See this issue.)

March 5th. Corporation. Electrical stores for one year. (February 19th.)

Burnley.—March 15th. Electricity Department. Switchboard, switch and isolator gear with metering equipment, isolator and bus-bar unit, cable and transformers. (See this issue.)

Cannock.—March 15th. U.D.C. Electricity Department. switchgear and transformer. (February 19th.) An error occurred in the advertisement appearing in our last issue. The 3,000-kVA transformer required is to be oil cooled—not air cooled as stated.

Cardiff.—March 3rd. Electricity Department. Cables and meters for one year. (February 19th.)

Dover.—March 15th. Corporation. Rewiring Town Hall buildings. (See this issue.)

Dundee.—March 1st. Housing Department. Electric lighting installation at Mid-Craigie housing estate. City quantity surveyor, 21, City Square.

Edinburgh.—March 4th. Borough Council. Electrical materials for one year. (February 19th.)

Erith.—March 17th. U.D.C. Electricity Department. One four-panel switchboard with extension switch and sub-station metering equipment. (See this issue.)

Falkirk.—March 12th. Electricity Department. Two 500-kVA transformers. (See this issue.)

Farnworth.—March 5th. U.D.C. Electricity Department. Washboilers and breakfast grillers. (February 19th.)

March 19th. Sub-station equipment. (February 19th.)

Fife.—March 8th. County Council. Electric lighting in forty-four houses on the Coaltown of Balgonie housing estate. J. Gentles & Son, surveyor, Central Chambers, Kirkcaldy (deposit £1 1s.).

Gellygaer.—March 15th. U.D.C. Electricity Department. Electrical stores for one year. (See this issue.)

Great Yarmouth.—March 1st. Corporation. Electrical materials for one year. (February 19th.)

Heston and Isleworth.—March 11th. Electricity Department. Switchgear, transformers, and sheet-steel kiosk. (See this issue.)

Hoylake.—March 3rd. U.D.C. Electricity Department. Meters. (February 19th.)

Kilmarnock.—March 8th. Town Council. One year's supply of electric lamps. W. Dunbar, burgh surveyor.

Leyton.—March 8th. Corporation. Cable for twelve months. (February 19th.)

Lincoln.—March 6th. Electricity Department. One year's supply of electrical materials. (February 19th.)

London.—METROPOLITAN WATER BOARD.—March 19th. Electrically driven pumps, &c., at the Barnes Works, Lonsdale Road, Barnes. Chief engineer, Offices of the Board, 173, Rosebery Avenue, E.C.1 (deposit £2 2s. to the Comptroller to the Board).

Middlesex.—March 15th. County Council. Medium pressure main switchgear at the Central Middlesex County Hospital, Willesden. (See this issue.)

Middleton.—March 10th. Electricity Department. Underground cables. Borough electrical engineer, Corporation Street.

Milford Haven.—March 9th. U.D.C. Electricity Department. Electrical goods for twelve months. (See this issue.)

Portsmouth.—March 16th. Electricity Undertaking. Two 420-kW rectifier equipments. (See this issue.)

Rhondda.—March 27th. U.D.C. Electricity Department. Meters, copper wire and house service material for twelve months. (February 19th.)

South Africa.—JOHANNESBURG.—March 13th. City Council. 1,100 cable end boxes. (T.Y. 31171.)*

Southampton.—Electricity Department. Cables for one year. (February 19th.)

Stoke-on-Trent.—March 10th. Electrical Engineer's Department. Twelve months' supply of overhead transmission lines, a.c. motors and sub-station switchgear. (February 19th.)

Sutton and Cheam.—March 15th. Corporation. Electrical work at Cheam Baths and Public Hall, Malden Road. (See this issue.)

Uruguay.—MONTEVIDEO.—March 16th. State Electricity Supply and Telephones Administration. Steel masts for overhead power lines. (T.Y. 31169.)*

April 14th. L.c. telephone cables and lead jointing sleeves. (T.Y. 31173.)*

April 16th. Underground armoured telephone cable. (T.Y. 31172.)*

Walton and Weybridge.—March 16th. U.D.C. Electricity Department. Electrical materials for period ending March 31st, 1939. (See this issue.)

West Riding.—March 15th. Public Assistance Committee. Various works, including electrical and heating, at the alterations to the nurses' home at the County Poor Law Institution, Pontefract. P. O. Platts, County Hall, Wakefield.

Workington.—March 8th. Electricity Department. Twelve months' supply of electrical stores. (February 19th.)

Worthing.—March 11th. Corporation. E.h.v. and l.v. cables. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—SYDNEY.—County Council Electricity Undertaking. Accepted. Steam generating plant (£916,096).—Babcock & Wilcox, Ltd.—*Tenders.*

Bangor.—Accepted. Electrical work at the new B.B.C. station for the Welsh area.—T. Wood & Son.

Bedford.—Electricity Committee. Recommendde. 11,000-V transformer kiosk (£573) and 2,000-V kiosk (£325).—B.T.H.

Brighton.—Electricity Committee. Accepted. Evaporator (£3,396).—P. & B. Evaporators, Ltd. Electric goods lift at Southwick power station (£694).—Penrose Lifts, Ltd.

Buckhaven and Methil.—Town Council. Accepted. Electrical work at seventy-four houses (£546).—Moncrieff Bros.

Exeter.—Housing Committee. Accepted. Electric lighting installation in sixty-four houses on the Wonford estate (£452). C. Lye.

Glasgow.—Electricity Committee. Accepted. Three 2,000-kVA auxiliary transformers for the No. 2 works sub-station, Dalmarnock (£3,553).—C. A. Parsons & Co. Additional water-screening plant at Dalmarnock in connection with the extensions to the turbo-alternator plant, comprising four central flow band screens (£7,788), four centrifugal pumps (£305), and three self-cleaning strainers (£205).—F. W. Brackett & Co.

Health Committee. Accepted. Electrically operated sterilisers required for the Marion Reid Home for Children, Stobhill Hospital (£202).—Manlove, Alliot & Co.

Lighting Committee. Accepted. 300 extension pieces and 500 poles (£4,350).—Stewarts & Lloyds.

Transport Committee. Accepted. Cable.—Craigpark Electric Cable Co. (£9,520); Standard Telephones (£9,569). Stoneware conduits.—Albion Clay Co.; Doulton & Co. Steel tubing.—Scottish Tube Co.; Stewarts & Lloyds.

Grimsby.—Electricity Committee. Recommended. Boiler plant (£35,980).—Clarke, Chapman & Co. Cable for supply to Manby.—B. I. Cables. Switchgear (£1,491).—A. Reyrolle & Co.

London. — ISLINGTON. — Electricity Committee. Accepted. Domestic apparatus.—Burco, Ltd. (£240); Santon, Ltd. (£240); Simplex, Ltd. (£248); Bulpitt & Sons (£222); Premier Electric Heaters (£250).

BERMONDSEY.—Electricity Committee. Recommended. Nine-panel switchboard (£525).—Crompton Parkinson.

STEPNEY.—Electricity Supply Committee. Electric kettles for twelve months in connection with the domestic hire scheme:

	£		£
Bulpitt and Sons. Recommended	**1,462**	General Electric Co.	2,701
Falk, Stadelmann and Co. ...	1,883		

Electric irons for twelve months in connection with the above scheme:

	£		£
Falk, Stadelmann and Co. ...	363	Elexcel, Ltd.	637
Reve Electric Co. Recommended	**363**	British National Electrics ...	660
Simplex Electric Co.	396	General Electric Co.	680
Bulpitt and Sons	431	English Electric Co.	800
Cannon and Co.	459		

With regard to the supply of cookers, consideration of the quotations has been deferred pending the submission of a report by the Cooker Sub-Committee upon the result of its inspection of samples of the offers submitted.

Static sub-station kiosk on the Branch Road housing estate:

	£		£
Johnson and Phillips. Recommended	**777**	British Thomson-Houston Co. ...	975
Standard Switchgear	782	Ferguson, Pailin	1,004
General Electric Co.	934	Met.-Vick. Elecl. Co.	1,089
W. Lucy and Co.	967	Crompton Parkinson	1,112
Ferranti, Ltd.	969	English Electric Co.	1,170
		A. Reyrolle and Co.	2,342

Cable in connection with a supply of electricity to the Leman Street premises of the Co-operative Wholesale Society, Ltd. (£951).—Standard Telephones.

Public Libraries and Museums Committee. Electric lighting and heating installation in connection with the Mile End Library extension:

	£		£
Constable, Hart and Co. Recommended	**875**	Barlow Bros. and Co.	1,095
Bective Electrical Co.	1,042	J. Holder and Co.	1,100
L. G. Tate and Co.	1,089	J. G. Sneath	1,139
		D Assersohn	1,444

WESTMINSTER.—Highways Committee. Accepted. Electrical installations at Central Depôt.

	£		£
Pinching & Walton. Accepted ...	**6,317**	F. H. Wheeler & Co.	6,888
Francis Polden & Co.	6,549	Higgins & Cattle	7,943

Ten mercury-arc rectifiers (£1,260).—Nevelin Electric Co.

Recommended. Electrical equipment for Ebury Bridge garage (£105).—Whitworth Electric Lamp Co.

HACKNEY.—Electricity Committee. Boiler house plant in connection with the proposed extension of the generating station:

	£		£
Simon-Carves, Ltd. Recommended	**134,044**	Stirling Boiler Co.	140,608
John Thompson	138,444	Mitchell Engineering Co. ...	141,966
		International Combustion ...	145,884

The above tender prices include a contingency amount of £7,500 to cover the cost of certain apparatus and instruments not manufactured by the boiler contractors.

Housing and Town Planning Committee. Electric lighting and power in new dwellings on the Shacklewell Lane housing estate:

	£		£
Holliday, Hall and Stinson. Recommended	**1,069**	E. Wight and Co.	1,254
F. H. Wheeler and Co.	1,091	J. Holder and Co.	1,585
		Wells and Moulder	2,103

L.C.C.—Housing and Public Health Committee. Recommended. Electric lighting, &c., in block 1 of dwellings on the Pott Street area (£285).—Springvale Electrical Co. Electric lighting, &c., in blocks 3 and 4 of dwellings on the Barnsbury estate (£610).—Jacob, White & Co. Wiring and fittings for electric lighting, &c., in 1,058 dwellings on the fourth section of Mottingham estate:

	£		£
Holliday and Son (Electrical). Accepted	**7,323**	South Metropolitan Electric Light and Power Co.... ...	9,977
Read and Partners	7,950	Newman and Watson	10,157
Archibald Meckhonik	8,253	G. E. Taylor and Co.	10,915
Coleby and Co.	8,485	W. H. Gaze and Sons	12,884
City Electrical Co.	8,775	Harland and Wolff	13,200
Buchanan and Curwen... ...	9,662	The chief engineer's comparable estimate is £9,466.	
Francis Polden and Co. ...	9,677		
Ryland's Electrical Co.... ...	9,736		

Establishment Committee. Five electric passenger lifts and two electric goods lifts for the new County Offices. Tenders invited for (a) gearless lifts of modern design, with electric door openers on passenger lifts and manual operation of doors on goods lifts; (b) geared lifts with electric and manual operation of doors as in (a); and (c) passenger lifts as on basis (b) and electric operation of goods lifts doors:

	(a) £	(b) £	(c) £
Waygood-Otis. Accepted	**29,963**	29,035	29,239 (corrected to £29,185)
Evans Lifts	34,430	33,190	33,250
Express Lift Co.	35,332	33,832	—
Bennie Lifts (incomplete)	—	24,756	25,756
Marryat and Scott (incomplete) ...	—	27,854	27,854

The chief engineer's comparable estimate on basis (a), prepared before the recent rise in costs, was £27,500.

Middlesbrough.—Town Council. Accepted. Three 11,000-V circuit-breakers.—English Electric Co.

Southend-on-Sea.—Town Council. Accepted. Cables.—Pirelli-General Cable Works; Telegraph Construction Co. Cables for an overhead line from Stone Bridge, Barling, to Sutton Road (£1,298).—Callender's.

Forthcoming Events

Institution of Electrical Engineers.—Monday, March 1st. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "The Domestic Radiator in Relation to the Purchase of Bulk Supply and the Grid." To be opened by Mr. C. L. Westlake.

North Midland Centre.—Tuesday, March 2nd. Hotel Metropole, Leeds, 7 p.m. "Applications and Construction of On-Load Tap-Changing Gear on Transformers." Mr. H. Diggle. Friday, March 5th. Hotel Metropole, Leeds. 7 for 7.30 p.m. Annual dinner.

North-Western Centre.—Tuesday, March 2nd. Engineers' Club, Manchester. 7.15 p.m. "Fire Precautions in Major Electrical Stations." Mr. F. C. Winfield.

Wireless Section.—Wednesday, March 3rd. Institution, London, W.C.2. 6 p.m. "A Survey of Marine Radio Progress, with Special Reference to R.M.S. *Queen Mary*." Commdr. F. G. Loring, W. L. McPherson and W. H. McAllister.

Meter and Instrument Section.—Friday, March 5th. Institution, London, W.C.2. 7 p.m. "The Metering of Mercury-Arc Rectifier Supplies and Outputs." Mr. C. Dannatt.

Electrical Development Association *(Northern Ireland Area).*—Friday, February 26th. Ireland. Annual meeting and luncheon.

(North-West England and North Wales Area.)—Friday, March 5th. Midland Hotel, Manchester. 12.30 for 12.45 p.m. Annual luncheon.

Institution of Chemical Engineers.—Friday, February 26th. Hotel Victoria, London, W.C.2. 11 a.m. Annual meeting. 7 for 7.30 p.m. Annual dinner.

Association of Supervising Electrical Engineers.—Saturday, February 27th. Trocadero Restaurant, London, W.1. 6.30 for 7 p.m. Annual dinner and reunion.

Electrical Power Engineers' Association *(South Coast Section).*—Saturday, February 27th. Kimbell's Café, Southsea. Annual dinner and dance.

(London Technical Group.)—Tuesday, March 2nd. Caxton Hall, London, S.W.1. 7.15 p.m. "Efficiency Testing of Power-House Plant." Mr. C. E. H. Verity.

Electrical Wholesalers' Federation.—Thursday, March 4th. Savoy Hotel, London, W.C.2. Annual dinner.

Faraday House Old Students' Association.—Thursday, March 4th. Hotel Great Central, London, N.W.1. 8 p.m. Annual dance.

Birmingham Electric Club.—Friday, March 5th. Grand Hotel, Birmingham. 6.30 for 6.50 p.m. Annual dinner.

North-East Coast Institution of Engineers & Shipbuilders.—Friday, March 5th. Old Assembly Rooms, Newcastle-on-Tyne. 6.30 for 7 p.m. Annual dinner, conversazione and dance.

Notes

The I.M.E.A. Convention Exhibition

An exhibition is being arranged in connection with the I.M.E.A. Convention at Brighton in June next. Applications for space should be sent by March 1st to the British Electrical Development Association, 2, Savoy Hill, London, W.C.2. A notice relating to this exhibition appears in our advertisement pages to-day.

E.P.E.A. Dinners

The annual dinner and dance of the Devon and Cornwall Section of the Electrical Power Engineers' Association was held at Plymouth on February 13th. About 100 were present, and Mr. R. Ferguson, the chairman of the Section, presided.

The speakers included Mr. W. A. Gallon, deputy electrical engineer, Plymouth (who deputised for his chief, Mr. H. J. Midgley, who was absent through illness), and Messrs. Cox (president), W. A. Jones (general secretary), F. G. Jones (Plymouth), and B. W. Ricks (Section hon. secretary), and Councillor Mrs. C. H. Daymond.

There was a large attendance of representatives of the electrical industry in the Midlands at the annual dinner-dance on Friday last week of the Birmingham and District Section of the Association. The guests were received by Mr. H. S. Davidson, chairman, and Mrs. Davidson. Mr. S. T. Allen, manager, Central England Area, Central Electricity Board, proposed the toast of "The Association." He said that many reconstruction schemes were in progress throughout the country, but when these came to an end they would have to sell more goods abroad. That would be difficult because of growing international competition; reserves should now be provided by manufacturers to make great commercial efforts abroad. Mr. H. J. Cox, who responded, stated that the Association was making an effort to provide a scheme by which there would be qualifications to enter the Association. Other speakers were Mr. H. S. Davidson and Mr. F. Forrest, chief engineer and manager of the Birmingham Supply Department.

Handbook of Specifications

The half-yearly handbook, which includes the indexed list of current British Standard Specifications to January 1st, 1937, is of particular importance to electrical engineers and the industry generally as it contains a special report on "Standardisation in the Electrical Industry" by Mr. C. P. Sparks. Another feature of this edition is a report of the director's recent visit to Argentina to study the question of standardisation locally. There are now over 800 technical and sub-committees in the three existing divisions of the work, *viz.*, building, chemical and engineering. Copies of the new handbook (under reference CE 2400) are available from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1. price 1s. 4d. post free.

Courses for Technical Teachers

The short courses for teachers in technical schools now being arranged by the Board of Education will be held at New College, Oxford, from July 24th to August 4th and will be conducted by Mr. H. J. Shelley and other inspectors of the Board. The primary aims of the courses are to consider the most suitable methods of presentation of certain subjects and to review recent advances in engineering and electrical science and practice. Application should be made before March 31st on Form 106 U (T), obtainable from the Board of Education, Whitehall, London, S.W.1.

Electrical Contacts

Mr. E. Downs, the author of the article on "Electrical Contacts" in our issue of January 29th, asks us to state that the furnace on the left of the photograph on page 169 showing the forging of a platinum ingot is heated by means of gas.

Appointments Vacant

Senior assistant sub-station engineers for the North-Eastern Electric Supply Co., Ltd.

Clerical assistant in the electricity costing section of the Worksop borough treasurer's office.

Meter repairer and tester for Dearne District Electricity Board.

Junior control centre engineers for the London Power Co., Ltd.

Installation engineer for St. Helens Electricity Department.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Domestic cream machine with reciprocating action.
ROGER vitalator.
MICALENE.
ALBA shaper.
The address of Purit Specialities, Ltd., is required.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. Frank Parkinson, M.I.E.E., has accepted the invitation of the Court of the Electrical Industries Benevolent Association to be President of the Association during 1937-8. His installation will take place at the annual general meeting at the Savoy Hotel on Friday, April 9th, during which he will take the chair.

Mr. A. Miller, of Bush House, Aldwych, W.C.2, has been appointed to a seat on the board of the Brush Electrical Engineering Co.

Mr. H. D. Parsons

Mr. H. D. Parsons, a member of the publicity staff of Johnson & Philips, Ltd., for fourteen years, has been appointed publicity manager to the company. Mr. Parsons joined Johnson & Phillips, Ltd., as a commercial artist after leaving the drawing office of the India Rubber, Gutta Percha and Telegraph Works, Co., Ltd., Silvertown.

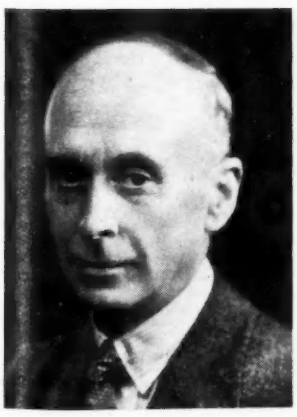
Mr. A. P. McDouall, who recently retired from the post of chief engineer to the Notting Hill Electric Lighting Co., Ltd., after forty years' service, was presented by the staff on February 18th, with an inscribed gold watch.

Mr. J. G. Kellie, A.M.I.E.E., chief assistant electrical engineer to the Ealing Corporation, was appointed borough electrical engineer to the Stafford Town Council at a special meeting of the Council held on February 18th. Mr. Kellie was educated at the University of Liverpool and served his apprenticeship with Cammell, Laird & Co., Ltd. After four years with the Yorkshire Electric Power Co., he joined the Norwich Corporation Electricity Department in charge of the Northern Area supply, which he was responsible for developing, including fifty villages and townships. He was appointed chief assistant electrical engineer at Ealing in April, 1934.

[Swain

Mr. J. G. Kellie

Mr. G. Watson, M.Inst.C.E., M.I.Mech.E., consulting engineer, has removed his office from Buckingham Gate to 12, Stratford Place, London, W.1. (Tel.: Mayfair 3154.)



Mr. W. E. Foden

Mr. W. E. Foden recently retired from the post of financial controller to the Manchester Corporation Electricity Department after nearly thirty-nine years' service in that capacity. After training with a prominent firm of Manchester chartered accounts he was appointed by the Manchester Corporation in 1898, and from then up to February 6th last was charged under four chief engineers and managers with financial administration, rating, taxation, Central Electricity Board financial relationship and advising on general financial policy. The four chiefs were the late Mr. Wordingham, the late Mr. Metzger, Sir Leonard Pearce (for nearly a quarter of a century) and Mr. H. C. Lamb, the present chief. Mr. Lamb and his staff presented Mr. Foden on leaving with a set of the *Encyclopædia Britannica* in a bookcase, while from the Electricity Committee he received an electric refrigerator at a luncheon to which they entertained him on February 17th. Mr. Foden informs us that he has begun practice as an incorporated accountant at 6, Nicholas Street, Manchester, 1, where local authorities will be able to consult him on electricity supply finance.

Mr. G. B. Mansell, joint managing director of Briton Lamps, Ltd., and **Mr. C. D. Falcke,** of John Ismay & Sons, Ltd., are forming a sales organisation and conducting a lamp sales campaign for Messrs. Ismay.

Mr. A. S. Ward and **Mr. J. Vickers** have been appointed directors of the Widnes Foundry and Engineering Co., Ltd.

Mr. S. H. Parsonage, who was recently appointed sales manager of Compound Electro Metals, Ltd., which specialises in high-efficiency metals for contacts and electric resistance welding electrodes, was previously with Evershed & Vignoles, Ltd., and in July, 1933, he contributed an article to the ELECTRICAL REVIEW on tests of artificial earthing systems.

Mr. S. H. Parsonage

Mr. Ll. B. Atkinson has been elected an honorary member of the British Electrical and Allied Industries Research Association.

Capt. D. S. Wood has retired from his position as assistant superintendent of the Ribble power station, Preston, and he was recently entertained at a social function and presented with a silver rose bowl. Tributes to his work were paid by Mr. M. A. Wills (Central Electricity Board) and colleagues of the staff of the works.

Mr. Asger Vilstrup, chief engineer of the British Columbia Electric Railway Co., Ltd., has been elected president of the Engineering Profession in British Columbia for the current year, states the official organ of the American I.E.E. From 1903 to 1909 Mr. Vilstrup, who is a Dane, was employed by several English companies, including B.I. Cables, Ltd.

Obituary

Mr. John Owen Girdlestone, M.I.E.E., joint managing director of the Westminster Engineering Co., Ltd., died on February 17th, at the age of seventy-six years. After serving his engineering apprenticeship in London, and spending two years afloat, as a marine engineer, he joined Crompton and Co., at Chelmsford, and whilst there, in 1882, designed one of the earliest hot-wire voltmeters. He spent six years with Latimer Clark Muirhead and Co., as manager of their Engineering Department, and later went to Veritys, Ltd., as electrical engineer, superintending several large installations including, amongst others in London, the original complete installation at the Savoy Hotel, and the New Palace Theatre. He left Veritys in 1890 to start in business with a partner as Girdlestone & Co., as electrical engineers and contractors in London, and in 1896, along with others, he founded the Westminster Engineering Co., Ltd., and took over the old premises of Latimer Clark Muirhead & Co., in Westminster. In 1901 his company removed to Victoria Rd., Willesden, where the works are still situated. Mr. Girdlestone was the joint inventor and patentee of the "Westminster" arc lamp. He was a director of the company until the time of his death, though recently ill-health prevented him from taking an active part in the business.

[Elliott & Fry

The late Mr. J. O. Girdlestone

Prof. F. A. Laws.—The death is recorded in the official organ of the American I.E.E. of Prof. Frank Arthur Laws, emeritus professor of electrical measurements at the Massachusetts Institute of Technology. His textbook, "Electrical Measurements," is widely used and is recognised as one of the leading works of its kind in the English langauge.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Brilliant Signs, Ltd.—Private company. Registered February 18th. Nominal capital, £100. Objects: To acquire the business, undertaking and assets of Brisig, Ltd. (formerly the Brilliant Sign Co. (1907), Ltd.), and to carry on the business of manufacturers of and dealers in brilliant sign letters and neon signs, illuminated sign letters, &c. The subscribers are: G. W. Treadwell, 67a, Shooters Hill Road, Blackheath, S.E.3; and F. H. Morley, Patmore Hall, Albury, Herts. Solicitors: Clifford Turner & Co., 11, Old Jewry, E.C.2.

Litz Wire, Ltd.—Private company. Registered February 17th. Capital, £5,000. Objects: To carry on the business of manufacturers of insulated, electrical and other wires, &c. The subscribers are: H. J. Austen, 72, Greenway, Raynes Park, S.W.20; and S. G. W. Norton, Norton House, Peaks Hill, Purley, Surrey. Secretary: H. J. Austen. Registered office: 14, Bedford Row, W.C.1.

Super Vacs, Ltd.—Private company. Registered February 16th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in household and factory cleaning apparatus, domestic appliances, &c. The directors are: V. Barrett, 8, Mount Pleasant, Holborn, W.C.1; and G. A. Clare, 108, Norfolk House Road, Streatham, S.W.16.

Neon Signs (Blackpool), Ltd.—Private company. Registered February 17th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of and wholesale and retail dealers in neon advertising and lighting signs, &c. The directors are: T. H. Gilpin, 3, Stopford Avenue, Blackpool; and B. P. Mallalieu, 134, Hornby Road, Blackpool. Solicitors: C. M. Philipps & Son, Market Chambers, Corporation Street, Blackpool.

Taylor and Clare, Ltd.—Private company. Registered February 8th. Capital, £1,000. Objects: To carry on the business of suppliers of and dealers in all kinds of electrical equipment, &c. The directors are: V. J. S. Taylor, 17, Woodvale Avenue, South Norwood, S.E.25, and three others. Registered office: 3, Colonial Avenue, E.C.3.

Returns of Electrical Companies

Brown & Co. (Electrical Engineers), Ltd.—Capital, £5,000 in £1 shares. Return dated December 29th, 1936. 4,529 shares taken up. £12 paid, £4,517 considered as paid. Mortgages and charges nil.

Page & Girling, Ltd.—Capital, £2,000 in £1 shares. Return dated December 18th, 1936. All shares taken up. £2,000 paid. Mortgages and charges nil.

Erimus Electrical Factors, Ltd.—Capital, £500 in £1 shares. Return dated September 29th, 1936. 335 shares taken up. £260 paid. £75 calls unpaid. Mortgages and charges nil.

Telephone Company of Pernambuco, Ltd.—Particulars filed of £20,000 debentures, authorised December 18th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £11,000. (The above debentures rank in priority to existing 8 per cent. debentures.)

Kego Electric Co., Ltd.—(a) Particulars filed of £1,000 debentures authorised February 4th, 1937, constituting a first charge on the company's property and assets, present and future, including uncalled capital, the whole amount being now issued. (b) Particulars filed of debentures not exceeding £500, authorised February 4th, 1937, charged as above (subject to 1st debentures), the amount of the present issue being £500.

Sun Electrical Co., Ltd.—Capital, £250,000 in 125,000 preference and 125,000 ordinary shares of £1. Return dated October 22nd, 1936. 125,000 preference and 93,311 ordinary shares taken up. £218,311 paid. Mortgages and charges, nil.

Simplex Electric Switchgear, Ltd.—Capital, 100 in £1 shares. Return dated November 10th, 1936. All shares taken up. £100 paid. Mortgages and charges, nil.

Watliff Co., Ltd.—Capital, £10,000 in 7,000 preference and 3,000 ordinary shares of £1. Return dated August 26th (filed September 9th), 1936. All shares taken up. £9,880 paid on 7,000 preference and 2,880 ordinary shares. £120 considered as paid on 120 ordinary shares. Mortgages and charges, £4,500.

Ricardo & Co. Engineers (1927), Ltd.—Capital, £21,000 in 20,000 shares of £1 and 20,000 shares of 1s. Return dated November 9th, 1936. All shares taken up. £2 paid. £20,998 considered as paid. Mortgages and charges, £2,900.

City Notes

The Lancashire Electric Light & Power Co., Ltd., held its annual meeting on February 18th, when Mr. G. Balfour, M.P. (chairman), who presided, said that trade during the year showed a regular increase and in each month of 1936 there was a rise in Lancashire trade as compared with the corresponding months of 1935. Industrial indications were at present satisfactory, and the progress should continue throughout the year. In 1936, £630,435 was expended upon capital account, £411,697 of which was used on the generating station, £448,000 being spent on Kearsley, but £36,000 was written off plant at the Radcliffe station, and £217,704 on the distribution system. The new 50,000-kW set at Kearsley was brought into commission in October last and was fully loaded in November, and it was interesting to note that the cooling tower at this station was the largest in the world. The expenditure on mains and distribution included about ninety-five miles of low-voltage cables and forty miles of high-voltage cables, bringing the total of high-voltage cables and mains up to 784 miles, and the low-voltage distribution to 986 miles. During the year the Central Electricity Board issued directions for the installation of a second 50,000-kW turbo-generator set at Kearsley, to be completed by the autumn of 1938, and this extension was now in hand. The statutory charges on this set were payable by the Central Board until the company required part or all of the set's output. The efficiency of their generating plant was well maintained during the year, although detrimentally affected by plant laid off for repair. A maximum load of 101,300 kW was supplied from Kearsley, 45,647 kW from Radcliffe, and 17,428 kW from Padiham, resulting in a coincident maximum combined load of 157,231 kW. During 1936 an additional 5,927 domestic consumers were connected as compared with 5,680 in the preceding year, being a rise of about 15 per cent.; out of a total of 39,123 consumers of this class, 33,377 had adopted the two-part tariff. Revenues from this source increased, although tariffs had been reduced, and the kWh consumption per consumer had risen nearly 10 per cent. overall; the overall kWh price to the low-voltage consumers had dropped from 2.061d. to 1.92d. Sales of electricity rose from 330,000,000 kWh to 370,000,000 kWh, while the quantity taken by the Central Board increased by 17,000,000 kWh to 184,000,000 kWh. Showrooms were opened during the year at Ramsbottom and Whitefield. Extensions to the distribution system during 1936 had been mainly carried out in districts with a population of about one person per acre.

Resolutions were passed approving the conversion of the company's shares into stock and increasing the capital to £4,571,415 by the creation of 1,000,000 new shares of £1 each.

The English Electric Co., Ltd., held its annual meeting on Wednesday last, when Mr. G. H. Nelson (chairman), who presided, said that they had entered 1937 with the largest order book in the history of the company. A large part of this increase was the direct result of their keeping the technical staff intact, developing new lines and improving old designs during the depression. The orders were satisfactorily distributed over their products. The rate of production in their factories for the last three months of the year was double that of the first three months. In spite of this increase, they had not exhausted the possibilities of further production at their works. They had planned to increase their output and providing they could obtain the materials and any additional labour that they might require they could produce on a still larger scale. Referring to the continually rising prices of materials and applications for advances in wages in all branches of industry, Mr. Nelson said that it was the policy of the company not to take advantage of what was now a manufacturers' market, but to do no more than sell their products at a price that gave them a reasonable profit. Trading overseas was still difficult and competition was severe from the European Continent. The company's export trade had now reached 32 per cent. of their total order book, and in actual money was 60 per cent. more than last year. They were definitely allocating a certain percentage of their productive capacity for overseas requirements. They continued to give the closest attention to problems associated with the electrical industry, and they were extending their research activities in many directions. In the past they had relied upon the Westinghouse Co. and the possessors of English testing stations for testing facilities for their switchgear research. These were now not sufficient for their needs, and they were building and equipping a new switch-testing station which would be in operation during the current year. Associated with this testing station they were providing facilities for the surge testing of transformers. They had been entrusted with substantial orders by the Central Electricity Board, electricity supply undertakings, transport authorities and large and small industrial factories. At the Willans Works, Rugby, they had just completed for Bermuda the largest solid injection Diesel engine built in this country for land purposes, and their Diesel business generally had risen to a satisfactory volume. They had received the contract for the supply of a complete Diesel propelling equipment for a new Committee vessel for Trinity House. The Yorkshire Electric Power Co. had placed an order with them for two 40,000-kW, 3,000 r.p.m. sets, and they were continuing to receive substantial business in water turbines. In connection with the contract for the Polish railway they had 3,300-V d.c. rectifiers in operation. Substantial orders were continuing to be received from the Southern Railway for its suburban and express stock, and further orders had been received from the New Zealand Government for complete motor coach trains and electrical equipment for locomotives. Orders had also been received for over 100 complete Diesel rail coaches for certain of the British-owned railways in Argentina and also for Diesel-electric trains for the Ceylon Government Railways. These orders for railway rolling-stock had enabled them to reopen a large portion of the Preston works. With regard to the future, the past year showed considerable progress on 1935, and they anticipated that the results of the current year would be even better.

Mather & Platt, Ltd.—Presiding at the annual meeting held on Tuesday last Mr. L. E. Mather (chairman) said that in spite of continued difficulties which hampered foreign trade, and increased costs of materials and labour, they had made a slight increase in profits over the preceding year. Most of their contracts were for normal civil work, and being well occupied in this direction they had no wish to take part in any great measure in the defence programme. The Government policy that munitions must not interfere with civil production prevented any curtailment of the services their company rendered to industry as a whole. There had been an improvement in some directions in the export market, but

unfortunately this had been offset by lack of confidence in other directions, to which was added the many restrictions still in force. Internal competition due to greater industrial activity was also evident in many countries. With regard to overseas trade their policy of fostering this, even at a considerable cost, was a sound one, although results from abroad last year could have been better. They had secured the contract for calico printing machinery for a Government textile mill in Turkey, while centrifugal pumping plant had been supplied for irrigation development in India and pumps and motors for mines and power stations in South Africa. In Egypt they were supplying their largest axial flow type pump for land drainage. Prospects for the current year were good; they had started well and with a large amount of invoiced business carried over could look forward to a busy year.

Waygood-Otis, Ltd., held its annual meeting on February 17th, when Mr. D. W. R. Green (chairman) said that during the past year they had handled a larger volume of business than ever before. Many improvements had been made in both lifts and escalators and technical progress was continuous. The market for escalators continued to expand, and they had recently completed a notable escalator installation at Olympia. Messrs. Boots had also entrusted them with orders for escalators in their shops at Watford, Newcastle and Aberdeen, while in Blackpool they were at present installing six escalators for Messrs. R. N. O. Wills. Altogether they had been responsible for over 250 installations in this country, and they had been very active in the export market. With regard to the future, they had on their books sufficient work to indicate that there should be no falling-off in production for some time to come.

Crabtree Electrical Industries, Ltd., held its statutory meeting on Tuesday last, when Mr. H. F. McLoughlin (chairman) said that they were considering the payment of an interim dividend on the ordinary shares by March 31st. The operating company was working to full capacity, and its production facilities were being extended in order to keep pace with the order book. The buoyant condition of the building and electrical industries could not, however, continue indefinitely, and they did not propose to embark upon any rash programme involving extensive capital expenditure. They were not dividing the profits of the operating company up to the hilt in the shape of dividends as they preferred to strengthen the financial structure of the company against whatever uncertainties the future held in store.

The Midland Counties Electric Supply Co. reports a net revenue for 1936 of £337,480, against £332,600 in the previous year. With £7,864 brought in this makes £345,344. Reserve receives £25,000 and the ordinary dividend for the year is raised from 7½ per cent. to 8 per cent. by the final distribution of 5½ per cent. The amount carried forward is £11,647. Additional capital will be required to meet expenditure already incurred and to provide for current and future extensions, and at the annual meeting on March 3rd a resolution will be submitted for increasing the capital to £6,500,000 by the creation of 1,500,000 new shares of £1 each. It is also proposed to convert the existing preference and ordinary shares into stock.

The Northampton Electric Light & Power Co., Ltd., reports a net revenue for 1936 of £116,872, as compared with £110,347 in the preceding year, to which is added income from investments, &c., £7,045, balance of income tax account, £3,953, and £15,031 brought in, making £142,901. The ordinary dividend for the year is maintained at 10 per cent. by a final distribution of 6 per cent., and £18,445 is carried forward. The sales of electricity to the Central Electricity Board were 116,190,560 kWh, an increase of 19 per cent., and the sales to the company's own consumers and in bulk to associated companies were 75,598,298 kWh, an increase of 14¼ per cent. The maximum load on the system was 29,742 kW. New 30,000-kW turbo-alternator and auxiliary plant was brought into use during the year. Meeting: March 1st.

The Rushden & District Electric Supply Co., Ltd., reports a profit for 1935 of £10,672 (against £12,162 in 1935), to which is added balance of tax account (£568), and £2,206 brought in, making £13,446. The final ordinary dividend is 4½ per cent., making 8 per cent. for the year (same) and £2,724 is carried forward. The number of kWh sold increased from 6,734,757 to 7,604,478.

Electrical Switchgear and Associated Manufacturers, Ltd., was to hold a meeting yesterday (Thursday) to consider a resolution for increasing the capital to £275,000 by the creation of 25,000 5 per cent. preference £1 shares and 50,000 ordinary 10s. shares. An issue will be made of 25,000 ordinary shares at 25s. in the proportion of one for every ten held. It is also proposed to issue 15,000 preference shares at 21s. 6d. subject to a brokerage of 3d. per share. These new shares will produce about £46,000 net, of which £30,000 will be set aside for additions to the works of Brookhirst Switchgear, Ltd., at Chester.

The London Electric Supply Corporation, Ltd., reports a profit for 1936 of £87,888, as compared with £83,080 in the preceding year, to which is added £66,270 brought in and £33,199 interest from investments, making a total of £187,357. It is proposed to pay a final ordinary dividend of 4 per cent., making 7 per cent., for the year, and a bonus of 1 per cent., being a proportion of the consumers' benefit. Reserve fund No. 2 receives £8,623, and £66,852 is carried forward. The sales of electricity during the year amounted to 367,224,832 kWh, as compared with 343,207,758 kWh in 1935. Meeting: March 2nd.

The Bristol Tramways & Carriage Co. reports a balance on revenue account, after depreciation, of £184,028, as compared with £142,119 in the preceding year. The net profit is £162,705 (against £95,540), and the final ordinary dividend is 5 per cent., making 8 per cent. for the year (6 per cent.). Reserve for contingencies and renewals receives £15,000 and £15,556 is carried forward. During the year the issued share capital was raised to £2,050,308 by the issue of 550,308 new ordinary £1 shares. The company acquired by share exchange nearly the whole of the issued share capital of the Bath Electric Tramways, Ltd., and the Bath Tramways Motor Co.

The Mid-Southern Utility Co. reports a total revenue from its electricity, water and gas undertakings for 1936 of £107,542, as compared with £103,205 in the preceding year, to which is added £21,022 brought in, dividends, interest and service charges from a subsidiary (£8,693), and sundry interest (£42), making £137,300. It is proposed to pay the full statutory dividends of £6 5s. 6d. per cent. per annum on the "A" stock, £4 15s. 6d. per cent. per annum on the "B" stock, and £5 per cent. per annum on the "C" stock, all less tax, leaving £24,696 to be carried forward. The profit on the electricity undertaking was £66,233.

The South Wales Electric Power Co. reports a net revenue of £252,672, as compared with £203,346 in the preceding year. From this is deducted rates (£33,272), directors' fees (£1,750), debenture and other interest (£66,525) and depreciation and reserve (£90,000), leaving £61,124. With £5,797 brought in this makes £66,921. A dividend of 4½ per cent. is proposed on the ordinary stock (against 3½ per cent.), and £5,298 is carried forward. Meeting: March 1st.

Charles Clifford & Son report a profit for 1936 of £17,299, against £17,144 in 1935. A final ordinary dividend of 1s. per share maintains the distribution for the year at 10 per cent., and a bonus of 1s. per ordinary share is again paid, plus a "Jubilee" bonus of 6d. per share. The balance carried forward is £21,592.

The Rawlplug Co. reports net profits of £60,624 for 1936 (against £53,881 for 1935). The ordinary dividend for the year is 35 per cent. (against 30 per cent.), reserve receives £10,000, and £20,436 is carried forward.

Brilliant Signs, Ltd.—The list of applications was to open yesterday (Thursday) in an offer for sale of 120,000 6 per cent. cumulative preference shares at 10s. each at par and 150,000 ordinary shares of 4s. each at 7s. per share.

The Kalgoorlie Electric Power & Lighting Co. is offering 125,0000 ordinary shares of 10s. at par to ordinary shareholders in the proportion of one for every two shares held. The new shares will rank for dividend as from January 1st, 1937.

Newman Industries proposes to pay a dividend of 17 per cent. per annum on the ordinary shares, calculated from the date of incorporation (April 3rd) to December 31st.

The North-Eastern Electric Supply Co., Ltd., is paying a final dividend of 4½ per cent. on the ordinary stock, making 7 per cent. for 1936 (against 6 per cent.).

The National Gas & Oil Engine Co. announces an ordinary dividend for 1936 of 2 per cent., against nil for the previous six years.

J. & F. Stone Lighting & Radio has announced an interim dividend of 6 per cent. on the ordinary shares (against 5 per cent.).

The Dublin United Tramways has declared a final ordinary dividend at the rate of 4 per cent. per annum, making 3 per cent. for the year (against nil).

The Scottish Power Co. has announced a dividend of 1s. 1 1/5d. per £1 unit, making 8 per cent. for 1936 (same).

The City of London Electric Lighting Co., Ltd., has announced a final ordinary dividend of 4 per cent., making 7½ per cent. for the year (same).

Clyde Valley Electrical Power Co. has announced a final dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets and prices are undergoing such violent fluctuations from day to day as have not been witnessed for well over a year. The fall in gilt-edged stocks, started by the announcement of the Government's defence programme, is extending to securities of all descriptions. On the other hand, the shares of any company connected with base metals are being bought at rising prices. Amongst the shares of the industrial companies, the outstanding tendency has been the way in which prices have followed the flatness started by the British Government, and other stocks in the Consol market. Factors which in the ordinary way would be regarded as healthy bull points are allowed to go by the board. As an example, the publication by Cable and Wireless of the best January traffic index recorded since 1930 produced no effect upon the preference stock, although the "B" ordinary responded with an improvement of half a crown.

Base metal shares have been rampantly good, the prices of the metals advancing by leaps and bounds. Strong bouts of profit-taking have kept the markets in a state of high excitement.

Investment and speculation are alike perturbed at the way in which the prices of their stocks have fallen. The financial philosopher shrugs his shoulders. He maintains that we have often seen this sort of thing before, and that there is no occasion to worry at this latest demonstration of a temporarily weakened confidence in security prices.

It is many months since our own share-lists have shown so many, and in some cases such material, falls as those which mark this week's record.

Electricity Supply Shares

The opening of the dividend season in the Home electricity supply market has produced, so far, nothing so arresting as to prevent prices from reflecting the weakness of the gilt-edged market. Electricity supply shares are usually classed amongst those industrial equities which are considered vulnerable to rising yields on Government and other fixed-interest stocks. This vulnerability is shared by many of the soundest indus-

trial dividend-payers. Their prices had risen to gilt-edged levels of yield on the strength of their reliability from the investment point of view. The batch of declines shown this week in our list of electricity supply shares can be put down to this cause. Evidence of a maintenance, or increase, in the intrinsic value of the security comes almost daily from companies in this group now issuing their annual reports.

Price Movements

Edmundsons, North Metropolitans and Yorkshire Electric are among the shares most affected by all-round weakness in the market for electricity supply issues. Several others show losses of 1s. or more. Electrical equipment issues have had a bad week, with most of the leaders infected, more or less, with the gilt-edged malaise. British Insulated, which have had a very good run, reacted sharply from 6 11/16 to 5¼; other popular cable shares, including Callenders and Enfields, suffered, although to a lesser extent. General Electrics, Associated Electricals and Crompton Parkinsons all fell away, and dullness spread to a string of kindred shares. Resistance was offered by Lancashire Dynamos, which rose from 3⅝ to 3¾.

Electrical Equipment Shares

Telegraph Constructions are the shares of the moment among electrical equipment issues. Their re-entry, after a six years' lapse, into the dividend list was one feature of an eventful week in the market. Resumption of dividends was generally anticipated, but surprise that the rate should be as high as 7½ per cent. can be measured by the 6s. 3d. rise which ensued in the price, to 38s. 9d. Hall Telephones, which had already risen, on the dividend announcement, to 30s., have gone further ahead to 32s. since the report, showing net profits more than double last year's, was published. Ordinary shares of Midland Electric Manufacturing, which company, besides recommending a repetition of last year's distribution totalling 25 per cent., proposes to issue new shares in the shape of a one-in-three bonus, are quoted at 8⅝: the market in these shares is narrow. Electrical Switchgear attracted some attention at around 27s. 9d. on news of the proposed capital increase and interim dividend payment.

Brush Electric

The measure of success reflected in the English Electric Company's report, just issued, has encouraged buying of Brush Electrical Engineering ordinary stock on the analogy that present conditions in the heavy electrical equipment industry should now be doing for Brush the same as they have already done for English Electric. Industrial depression stopped the payment of dividends on Brush ordinary stock in 1931. Recovery has been tardy: in 1935, the Brush accounts were still showing a net loss, although this was materially lower than that of the preceding year. The ordinary stock has moved up during the past week or two from well under 40 to the present 53. There is an idea that the company may before long be in the capital market.

Cable and Wireless

Cable and Wireless preference stock, as already mentioned, received no benefit from the publication of a January traffic index, which is the best since 1930, when it was 96 as against 85.8 last month. This, coming on the top of the good December figures, confirmed the impression that Cable and Wireless traffics have taken a definite turn for the better and are reflecting the improvement in trade which is gradually taking place throughout the world. The January traffics were no doubt swollen by receipts arising from the Test matches in Australia, but apart from these it seems reasonable to assume that the ordinary commercial messages are showing steady expansion. The "A" ordinary stock rose from 26½ to 27¼ before reacting to the previous quotation.

North Metropolitan Power Station

Dealings began last Friday in this company's 3½ per cent. second mortgage debenture stock, dated 1945-1963, of which a £1,000,000 line has been privately placed. The price asked is 101¼, free of stamp duty, and the yield £3 9s. on the money. Interest on the stock is secured by a virtual rent charge on the North Metropolitan Electric Power Company, which leases the "Station" company's generating station, and whose current profits show a tenfold cover for the charge. The security gives, of course, a gilt-edged stamp to the debentures. A full half-year's interest is payable in September next.

Miscellaneous Matters

Interest in television shares has subsided to some extent after the excitement occasioned by recent events affecting both the transmitting and receiving sides of the business. E.M.I. shares at 24s. 3d. are on the dull side. Baird issues are fairly steady, and Scophony firm at 7s. 6d. Brazilian Tractions go from strength to strength; following a succession of big rises during the past month or so the price again stands 3 points higher this week at 30. Ordinary shares of Lancashire United Transport and Power, which company has just raised its dividend from 5 per cent. to 7½ per cent., can be bought at 34s. 6d. ex-dividend, to yield £4 6s. 9d. on the money. British Electric Traction preferred has relapsed from 167½ to 165: the deferred, at 1,475, is 125 points down. London Transport "C" stock is no better than 92. Quietness in rubber shares contrasts with the activity of other commodity markets.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Feb. 23.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	76/3	−⅛	3 18 9
City of London	1	7½	7½	37/6	−6d.	4 0 0
Clyde Valley	1	7	8	43/-	−2/-	3 14 7
County of London	1	10½	10½	52/6	−2/-	4 0 0
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Do. Ord.	1	8	8	41/6	−3/-	3 17 0
Elec. Dis. Yorkshire	1	9	9	43/-	−2/-	4 3 9
Elec. Fin. and Securities	1	12½	12½	3	−⅛	4 3 4
Elec. Supply Corporation	1	11	11	55/9	−½	3 19 2
Lancs Light and Power	1	7½	7½	37/-	−1/-	4 1 1
Lond. Assoc. Electric	1	—	7	35/-	—	4 0 0
London Electric	1	7	8	38/6	−6d.	4 3 1
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	49/-	−1/-	4 1 9
Midland Counties	1	7½	8	39/6	−6d.	4 1 0
Mid. Elec. Power	1	8	8	41/3	−⅛	3 17 6
North Eastern Electric Ordinary	1	6	6	31/6	−2/-	3 16 2
Do. 7% Pref.	1	7	7	34/-	−1/-	4 2 4
Northampton	1	10	10	48/9	−⅛	4 2 0
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	2½	−⅛	4 0 0
Do. do. 6% Pref.	1	6	6	29/6	−2/-	4 1 4
Scottish Power	1	8	8	40/6	−6d.	3 19 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	+6d.	6 7 8
Yorkshire Elec.	1	8	8	42/-	−½	3 16 2
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	112	−1	4 9 3
Do. 1955–75	„	5	5	115	−2	4 7 0
Do. 1951–73	„	4½	4½	108½	−½	4 3 0
Do. 1963–93	„	—	3½	97½	−2½	3 10 0
London Elec. Trans. Gtd.	„	—	2½	90½	−½	2 15 3
London & Home Counties, 1955–75	„	4½	4½	110	−2	4 1 10
London Passenger Transport, A.	„	—	4½	113½	−3½	3 19 4
Do. do. B.	„	—	5	119½	—	4 3 8
Do. do C.	„	3½	4	92	−4	4 7 0
West Midlands Joint Elec. 1948–68	„	—	5	114½	−1	4 7 4
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	178	−7½	5 1 1
Anglo-Am. Tel. Pref.	Stock	6	6	127½	—	4 14 1
Do. Def.	„	1½	1½	29½	−2	5 1 8
Cable & Wireless 5½% Pref.	„	4½	5½	109	−2	5 1 0
Do. A. 7½% Ord.	„	Nil	Nil	26½	—	—
Do. B. Ord.	„	Nil	Nil	8½	+½	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	15⅞	+½	2 17 2
Do. Do. Pref.	10	6	6	14½	—	4 2 9
Great Northern Tel.	10	20	20	44½	—	4 9 10
Marconi-Marine	1	10	7½	1⅞	—	4 0 0
Oriental Telephone Ord.	1	12*	12*	3 1/16	—	3 12 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	23½	−1	—
British Electric Traction Df. Ord.	„	5	5	1475	−125	—
Do. do. Pref. Ord.	„	8	8	165	−2½	4 15 5
Brazil Traction	$100	—	70 cts.	30	+3	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	7½	+4	—
Do. 1st Bonds	$500	5	5	45½	—	—
Victoria Falls Ord	1	20	12	76/3	—	3 3 2
West Riding	1	6½	10	48/9	−3/6	3 17 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	2½	—	5 9 4
Assoc. Elec. Ord.	1	6	8	50/6	−4/6	3 3 6
Do. Pref.	1	8	8	39/-	—	4 2 0
Babcock & Wilcox	1	8	8	52/-	+9d.	3 1 5
British Aluminium Ord.	1	7½	7½	46/-	—	3 5 3
British Insulated Ord.	1	15	20	5⅞	−1/16	3 8 0
Brush Ord.	Stock	Nil	Nil	53	+7½	—
Callender's	1	15	15	4⅝	−⅛	3 5 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	12½	12½	68/9	−7/16	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	3½	7	42/6	—	3 5 9
Enfield Cable Ord.	1	25	25	6	−½	4 3 4
English Electric	1	Nil	Nil	33/-	+1/-	—
Do. Do. Pref.	1	6½	6½	26/-	—	5 0 0
Ericsson Tel.	5/-	24	20*	52/6	−½	1 18 2
Ever Ready	5/-	35	35	32/6	−6d.	5 7 8
Ferranti Pref.	1	7	7	26/3	—	5 6 8
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	10	15	89/6	−4/6	3 7 0
Henleys	5/-	30	30	20/9	−6d.	3 12 5
Do. 4½% Pref.	1	4½	4½	1 3/16	—	3 15 9
India-Rubber Pref.	1	1⅛	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	48/3	−2/6	4 3 0
Lancashire Dynamo	1	5	10	3¾	+2/6	2 13 2
Siemens Ord.	1	4	6	31/3	−2/6	3 16 10
Telegraph Construction	£1	Nil	7½	38/9	+6/3	3 17 3

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

12277. "Discharge tubes using electrons and/or positive ions." W. Rogowski and F. Malsch. April 19th, 1934. (Cognate application 12278/35.) (460288.)

12807. "Radio receiving antenna systems." Marconi's Wireless Telegraph Co., Ltd. April 28th, 1934. (460570.)

15229. "Electric propulsion systems and methods of operating the same." Atlantic Refining Co. May 31st, 1934. (460436.)

17739. "Measurement or indication of the voltage on high-tension conductors." British Thomson-Houston Co., Ltd., and P. Mathews. June 20th, 1935. (460294.)

17837. "Means for obtaining variable speed control and/or power factor correction with asynchronous induction motors." M. A. Gill (legal representative of J. F. Gill, deceased) and J. N. Chaviara. June 21st, 1935. (Cognate application 28683/35.) (460364.)

18260. "Electric circuit-breakers." H. Milliken. February 12th, 1935. (460571.)

18304. "Insulated electric cable conductors." Okonite-Callender Cable Co., Inc. August 11th, 1934. (460515.)

21104. "Electric capacity-controlled devices applicable for indicating the approach of a body." A. C. Alexandra. July 25th, 1935. (460297.)

21105. "Electric capacity-controlled devices applicable for indicating the approach of a body." A. C. Alexandra. July 25th, 1935. (460298.)

21288. "Electric-discharge devices having cold cathodes." General Electric Co., Ltd., and H. G. Jenkins. July 26th, 1935. (460373.)

21349. "Cathode-ray tubes." Baird Television, Ltd., and C. Szegho. July 27th, 1935. (Cognate application 14855/36.) (460445.)

21383. "Coaxial conductor cables for electric transmission systems." Standard Telephones & Cables, Ltd., and H. Birkby. July 27th, 1935. (460446.)

21385. "Teleprinter apparatus." Creed & Co., Ltd., and R. D. Salmon. July 27th, 1935. (460447.)

21387. "Plug terminals for electric connections." Standard Telephones & Cables, Ltd., and G. W. Clarke. July 27th, 1935. (460448.)

21484. "Light-sensitive electric discharge devices." C. Szegho, T. M. C. Lance and Baird Television, Ltd. July 29th, 1935. (460579.)

21528. "Telephone systems." Automatic Electric Co., Ltd. September 6th, 1934. (460584.)

21533. "Electric switches suitable for operation by the passage of vehicles." Automatic Electric Co., Ltd., S. R. Smith and H. S. Woodhead. July 29th, 1935. (460585.)

21737. "Electric cables." Siemens Bros. & Co., Ltd., and A. E. Foster. July 31st, 1935. (460591.)

24201. "Radio receivers." E. K. Cole, Ltd., and R. I. Cowley. August 30th, 1935. (460305.)

30090. "Electric transformers." Foster Engineering Co., Ltd., and R. I. Bagnall. October 31st, 1935. (460449.)

32740. "Process and apparatus for firing porcelain or ceramic material in electrically or indirectly heated tunnel furnaces." Keramische Industrie-Bedarfs-Akt.-Ges. December 22nd, 1934. (Cognate application 32741/35.) (460386.)

34933. "Arrangement and disposition of parts in electrically driven self-propelled vehicles." Associated Equipment Co., Ltd., and A. T. C. Priddle. December 16th, 1935. (460333.)

35568. "Electro-magnetic interrupters." Oak Manufacturing Co. December 24th, 1934. (460470.)

1936

818. "Electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 2nd, 1935. (460471.)

2537. "Thermionic electrodes adapted to be heated by an electric discharge." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) January 27th, 1936. (460475.)

6257. "Fluorescent screen." Farnsworth Television, Inc. March 13th, 1935. (460479.)

9194. "Electrolytic capacitance devices." British Thomson-Houston Co., Ltd. March 30th, 1935. (460548.)

9882. "Discharge tubes using electrons and/or positive ions." W. Rogowski and F. Malsch. April 19th, 1934. (Divided out of 460288.) (Cognate application 12279/35.) (460397.)

10417. "Discharge tubes and arrangements for keeping voltages constant." Stabilovolt Ges. August 26th, 1935. (Cognate applications 10418/36 and 10419/36.) (460398.)

10598. "Lighting apparatus for signalling, advertising and the like." Holophane, Ltd. April 11th, 1935. (460617.)

11615. "Insulated electric conductors and methods of making the same." British Thomson-Houston Co., Ltd. April 23rd, 1935. (460347.)

14636. "Directional radio receivers." Telefünken Ges. für Drahtlose Telegraphie. May 24th, 1935. (460488.)

15410. "Superheterodyne radio receivers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 19th, 1935. (460408.)

15559. "Cathode-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 10th, 1935. (460409.)

15636. "Directional radio transmitting and receiving installations." Telefunken Ges. für Drahtlose Telegraphie. June 4th, 1935. (460490.)

16505. "Oscillation generators." Standard Telephones & Cables, Ltd. July 25th, 1935. (460623.)

16547. "Electrical impedance networks." Siemens & Halske Akt.-Ges. June 14th, 1935. (460355.)

17449. "Transformer windings." British Thomson-Houston Co., Ltd. June 24th, 1935. (460493.)

17586. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. June 25th, 1935. (460356.)

18731. "Devices for indicating current interruptions in connection with synchronous motor-driven clocks." British Thomson-Houston Co., Ltd. July 4th, 1935. (460496.)

19674. "Thermionic valve circuits." W. S. Percival. July 24th, 1935. (Divided out of 21077/35.) (460562.)

20552. "Manufacture of cells for electrolytic or electrostatic condensers or secondary batteries." R. Jahre (trading as R. Jahre Spezialfabrik für Kondensatoren.) July 30th, 1935. (460423.)

21075. "High-frequency coil." E. Michaelis. July 30th, 1936. (460503.)

21719. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd. August 16th, 1935. (460426.)

23073. "Transmission of ringing signals in carrier-frequency telephony systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 24th, 1935. (460428.)

23088. "Thermionic-valve holders." A. F. Bulgin and A. F. Bulgin & Co., Ltd. August 21st, 1936. (460507.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 17th:—

Sturtevant. No. 572098. Class 6. Fans, vacuum cleaning machines, &c.—The Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.

Yorcoron. No. 474282. All goods in Class 13.—The Yorkshire Copper Works, Ltd., Pontefract Road, Stourton, Leeds.

Poromax. No. 574175. Pormax. No. 574176. Class 40. Rubber separators for electric storage batteries.—Joseph Lucas, Ltd., Great King Street, Birmingham.

Measuring the Distance of Short Circuits

IMPEDANCE relays for the protection of transmission lines have a time lag which is dependent on the remoteness of the fault. In order that they may show the position of a breakdown, besides performing their chief function of cutting out the defective line section, the indications of the relay must, M. J. Schneider submits in a recent issue of the *Brown-Boveri Review*, be proportional to the remoteness of the fault, or, at least, vary continuously with the distance. If the relay has a non-continuous (step) characteristic, it will be able to indicate only the zone where the fault lies, *e.g.*, within the last quarter. Other factors influencing measurements which may cause trouble if relays and instrument transformers of the wrong type are used, are the nature of the short circuit, the resistance of the arc and the strength of the short-circuit current. Also, the generators which supply the system may not remain exactly in step during short circuit and the synchronising currents set up are superimposed on the short-circuit current proper, thus falsifying the indications of the relays.

Nevertheless, the author claims that the distance of a short circuit between phases can often be estimated within 10 per cent. of the correct figure. As an example he mentions the supply systems serving the town of Vardal, Norway, which is supplied from the Lillehammer power station over a 30-kV three-phase line. As this runs through hilly country, the location of faults, especially in winter when heavy snowfalls are experienced, was formerly a long and difficult task during which the supply to the town was cut off. Brown-Boveri distance relays were recently installed at Lillehammer station and in checking these when they were first brought into service, a short circuit was artificially produced at an intermediate station at what was supposed to be a distance of about 9½ miles. The relays, however, indicated nearly 18 miles, and it was discovered that due to a misunderstanding the distance had been incorrectly set down and was actually 17½ miles.

During the winter of 1935-36, there were three short circuits in all. Difference between indicated and actual faults varied from ¼ to 1¾ mile, with the result that it was possible to reduce materially the length of the stoppages of supplies.

Memorial to Bell

A movement in Edinburgh to do permanent honour to the memory of Alexander Graham Bell has recently made considerable progress, and it has now been decided to place a mural plaque on the house where he was born in 1847—16, South Charlotte Street. Mr. E. Seddon, Corporation electrical engineer, has taken a leading part in the movement. Co-operating with Mr. Seddon are Messrs. R. T. Skinner, D. S. Munro, and G. Crichton, a relative of Dr. Bell. Mr. Seddon wrote to the Institution of Electrical Engineers inviting its interest and co-operation and the Institution has replied that it is entirely favourable to the suggestion provided the Town Council will take over the maintenance of the tablet. The Lord Provost's Committee has indicated its approval, subject to the design of the tablet being satisfactory.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Addington.—Houses (29), Crossways; Addiscombe Garden Estates, Ltd., 3, Addiscombe Road, Croydon. Houses (14), Devonshire Way; Hunt Construction Co., Langland Gardens estate, Wickham Road, Shirley.

Annfield Plain.—Houses (172); U.D.C. surveyor.

Ashton-under-Lyne.—Houses (120), Cockbrook; H. Davies, architect, 4, St. Mary's Parsonage, Manchester.

Bacup.—Houses (240), Land's Ends and Rockcliffe; A. Beswick, Commercial Street, Stacksteads.

Bakewell (DERBYSHIRE).—Houses (28), Yeld Road; U.D.C. surveyor, Bath Street.

Batley.—Houses, West Bank Street, Healey, for the Co-operative Society, Ltd., Carlton Street.

Benfieldside (CO. DURHAM).—Houses; T. B. Leith, architect and surveyor, Council Offices.

Birmingham.—Block of modern flats, Rotten Park Road (£50,000), for Mr. Cotton, 35, Waterloo Street, with electrical work; B. Whitehouse & Sons, builders, Monument Road. Block of shops, Bristol Road South, Selly Oak; C. A. Sadler, builders, Wolverhampton Road, Birmingham. Factory, Crudworth, for the British Oxygen Co., Ltd., Thames House, Millbank, London, S.W.1.

Blaydon-on-Tyne.—Houses (24), Stella Lane; N. T. Barker, builder, Winlaton. Cinema, Winlaton, for J. H. Fisher; R. Burke, architect, Singleton House, Northumberland Street, Newcastle-on-Tyne. Stores for the Blaydon Industrial and Provident Society, Church Street.

Brighton.—Flats (59), Nelson Place (£32.506); Hamfield Estate, Ltd. Rebuilding, College of Art (£120,000); Maxwell Ayrton, architect.

Bristol.—Factory, near Patchway, for the Bristol Aeroplane Co.

Bromsgrove.—Houses (23), Fachway; F. L. Robson, Rubery.

Buckhaven.—Houses (74); Moncrieff Bros., Shorehead, Leven.

Cannock.—Factory, Redhill Road, Chadsmoor, for C. Greatrex & Son, Ltd., Walsall.

Canterbury.—Premises for the Canterbury & District Co-operative Society.

Cardiff.—Factory, Treforest Trading Estate, for the International Carbo-Ice Co., Ltd., of Canada.

Caterham.—Nurses' home to hospital (£21,983); W. H. Gaze & Sons, Ltd.

Chester.—Extensions to showrooms and works, Pepper Street, for the Anchor Motor Co., Ltd.; E. Pritchard, 16, Canal Street.

Chester-le-Street.—Houses (49), Urpeth; J. E. Gardner, builder, St. Cuthbert's Road, Gateshead-on-Tyne.

Cowes (ISLE OF WIGHT).—Flats (52), with shops, 3-6, The Parade, for the Central London Property Trust, 7, Pall Mall East, London, W.1.

Crawley.—Cinema, High Street; R. Cromie, architect, 35, Baker Street, London, W.1.

Crompton.—Houses (98), on four sites; F. T. Jones, surveyor, Town Hall, Shaw, Lancashire.

Croydon.—Fifteen shops and flats, South End; Progress Building, Ltd., 10, New Bond Street, London, W.1.

Cwmbran.—Houses (46), Clarkville site; F. Viney, surveyor, Council Offices.

Darlington.—Electricity offices; borough engineer.

Dawley.—Cinema, King Street, for the Town Hall Cinema Co., Ltd., Wellington.

Denham (BUCKS).—Houses (56); G. O. Way.

Derbyshire.—School, Tansley; J. Harrison, architect, County Offices, St. Mary's Gate, Derby.

Doncaster.—Houses, near Church Road, Wadworth; Roy Bowers, clerk to the R.D.C., Nether Hall.

Dudley.—Cinema, Dudley-Wolverhampton Road; H. J. Amies & Son, builders, Melbourne Street, Wolverhampton.

East Farleigh.—Houses (12), Stockett Lane; Maidstone R.D.C. surveyor.

Etwall (DERBY).—Cubicle block, and alterations to Isolation hospital, Sandy Pits Lane, for Repton Joint Isolation Hospital Committee; Arthur Eaton & Sons, architects, 6, The Strand, Derby.

Evesham.—Factory for John F. Seyfried & Sons, Ltd., Regis House, King William Street, London, E.C.4.

Exeter.—Houses (64), Wonford estate (£30,896); F. & E. Small. Civic buildings (£373.000); Bradshaw, Gass & Hope, architects.

Freshwater (ISLE OF WIGHT).—Police buildings and houses, for the Isle of Wight Standing Joint Committee; J. C. Millgate, architect, Quay Street, Newport, I.O.W.

Glasgow.—Hotel, Sauchiehall Street; Weddell & Inglis. Ice rink for the directors of Scottish Ice Rink, Crossmyloof; the manager. Students' union, gymnasium, swimming baths, &c. (£35.000), for the Royal Technical College; the principal. Extensions to works, Kelvindale Road; Bowie's Associated Services, Ltd.

Glossop.—School for St. Mary's for the Catholic Authorities; Hadfield & Cawkwell, architects, 19, St. James Street, Sheffield.

Hindley.—Cinema, Atherton Road; W. A. Whittle, architect, Bolton.

Hollingbourne (KENT).—Houses (32), various parishes; R.D.C. surveyor.

Irish Free State.—(CARRICK-ON-SUIR, CO. TIPPERARY).—Houses (107); M. J. Lonergan, engineer, Rathordan, Cashel, Co. Tipperary. (LIMERICK).—Houses (500). Drumrollogher and Caherconlis (£150.000), with electrical work; P. J. Sheahan, engineer. (MALLOW, Co. CORK).—Houses (82); Chillingworth and Levie and D. J. Buckley, Mallow housing architects, 11, South Mall, Cork. (SLIGO).—Mental hospital and surgical block (£80,000 each) for the Sligo and Leitrim Boards of Health.

Kent.—Boiler house and engineering works, County Hospital, Dartford (£26,605), extensions to County hospital, Farnborough (£59,285), County offices, Maidstone, and mental institution, Lyminge (£185,000); county architect.

Lancashire.—School for girls, Swinton; S. Wilkinson, architect, County Offices, Preston.

Lanchester.—Houses, Burnhope; R.D.C. surveyor.

Leamington.—Theatre, the Dell, for the Leamington and Warwick Dramatic Study Club.

London.—(BATTERSEA).—Tenements (230), Savonna Street (£123,800); L.C.C. architect. (BERMONDSEY).—Shops and flats, 26-32, Albion Street; Purvis & Purvis, 417, New Cross Road, S.E.14. (CAMBERWELL).—Rehousing, Albany Road area (£13,500); L.C.C. architect. (EAST HAM).—Houses (74), Bonny Downs site (revised plans), and maternity, child welfare and school clinics, public offices, &c., Barking Road (£38,075); borough surveyor. (GREENWICH).—Rehousing, East Street area (£143,000); L.C.C. architect. (PADDINGTON).—Houses, Gloucester Square and Radnor Place; Wimperis, Simpson & Guthrie, 61, South Molton Street, W.1. Rehousing, Clarendon Street area (£600,000); borough engineer. (ST. MARYLEBONE).—Block of shops and offices, Henrietta Street, Welbeck Street and Wimpole Street; E. G. W. Souster, 3, St. James's Street, S.W.1. Block of shops and offices, Little Portland Street; W. A. Lewis & Partners, 130, Regent Street, W.1. (ST. PANCRAS).—Flats (158), Queen's Crescent (£125,600); borough architect. (WESTMINSTER).—Rebuilding 96-9, Long Acre, and 1-19, Endell Street; Odhams Press, Ltd. (HAMPSTEAD).—Extensions to Henrietta Barnett School for Girls (£23.000); governors.

Lowestoft.—Extensions to factory, Rant Score; M. F. Robinson & Co., Ltd. Extensions to Shipyard works, Horn Hill; C. S. & I. C. Richards.

Macclesfield.—Houses (74), Pownall estate, for B. Cooke, Buxton Road.

Mansfield.—Houses (38), Skagby Lane; A. Farnsworth.

Meir (STAFFORDSHIRE).—Houses (36), Bright Street; F. Gibson.

Middlesbrough.—Houses, the Thorntree Farm estate (42 acres) and offices for the electricity undertaking, Linthorpe Road and Benson Street; borough engineer. Theatre (2.356 seats), Linthorpe Road (£60,000); J. Clayton, Darlington.

Milnrow.—Houses, Haugh, and bungalows, Cornfield Street; A. Travis, architect, New Market Chambers, Rochdale.

Morpeth.—Houses (70), Lynemouth; R.D.C. surveyor.

Newcastle-on-Tyne.—Additions to the mental hospital for C.C.; city architect, 18, Cloth Market.

Newport.—Factory for Bio-Chemical Research Products, Ltd., Fairoak Avenue.

Northern Ireland.—(BELFAST).—Studio for the B.B.C., Linenhall Street West; J. Miller, architect.

Northfield.—Office block, Woodgate Lane, for Bimetals, Ltd., Dartmouth Street, Smethwick (£30,000), with electrical work; George Webb & Co., builders, Soho Hill, Birmingham.

Nuneaton.—Cinema, Abbey Gate, for the Scala Theatres, Ltd.

Oban.—Houses (64), Dalintant; H. S. Russell, Fort William.

Pershore.—Extension to hospital; Management Committee.

Plymouth.—Houses (320) and flats, Elford Housing estate; city architect, Guildhall.

Portsoy.—Houses (32), Park Road; W. Christie, burgh surveyor, 39, Seafield Street.

Redcar.—Houses (42), Broadway; R. Cowie.

Rotherham.—Works, Grange Mill Lane, for the British Atchesson Electrodes, Ltd., 87, Fargate, Sheffield; G. Longden & Son, Ltd., Bankwood works, Sheffield, 3.

Ryton-on-Tyne.—Houses (43), Townley estate; G. E. Charlewood, architect, 4, Mosley Street, Newcastle-on-Tyne.

Skelmanthorpe.—Houses, Scissett, and Windmill Crescent; Simpton & Moxon, architects, Southgate Chambers, Wakefield.

South Shields.—Houses (2,000), Marsden; borough engineer. Hotel, Highfield Road, for McEwan & Co., Ltd.; W. & T. R. Milburn, architects, 17, Fawcett Street.

Spennymoor (CO. DURHAM).—Houses, Brewery Fields, and bungalows, Wraith school site, for the North-Eastern Housing Association; Hays & Gray, architects, 50, Camden Street, North Shields.

Stockport.—Houses (194), Walnut Tree site; W. F. Gardner, borough surveyor.

Thornton Heath.—Extensions to factory, Factory Lane; Mouldrite, Ltd.

Tipton.—School, Locarno Road, for E.C.; Scott & Clark, architects, Regent Chambers, Wednesbury.

Walsall.—Houses (100), Wolverhampton Road and Mouse Hill, for J. B. Glover Kelsall, The Grove, Norton Road, Pelsall.

Walton (SURREY).—Houses (30), Felix Road (£11,166); A. W. Sheppard, Addlestone, builder.

Washington (CO. DURHAM).—Houses (64); U.D.C. surveyor.

Watford.—Houses (120), Leavesden Green estate; W. W. Newman, borough engineer.

Wednesbury.—Houses (58), Dangerfield Lane; A. Booth, chartered architect, borough engineer and surveyor, Town Hall.

West Hartlepool.—Houses (94) and bungalows, Millbank estate; borough engineer.

West Lothian.—County buildings, Linlithgow, for C.C. (£50.000); county clerk, Linlithgow.

Weymouth.—Extensions to Weymouth College; S. Jackson & Sons.

Wigan.—Houses (170), Beech Hill estate; J. Dove, borough surveyor.

Wolverhampton.—Cinema, Bilston Street, for the A.B.C., Ltd. (£50.000), with electrical work; W. H. Jones & Co., Ltd., builders, Lockhurst Lane, Coventry.

Woodford.—Development of Hill Farm estate, Woodford Bridge; Tudor Properties, Ltd.